AUG 16 1924

Engineering News-Record

Devoted to Civil Engineering and Contracting
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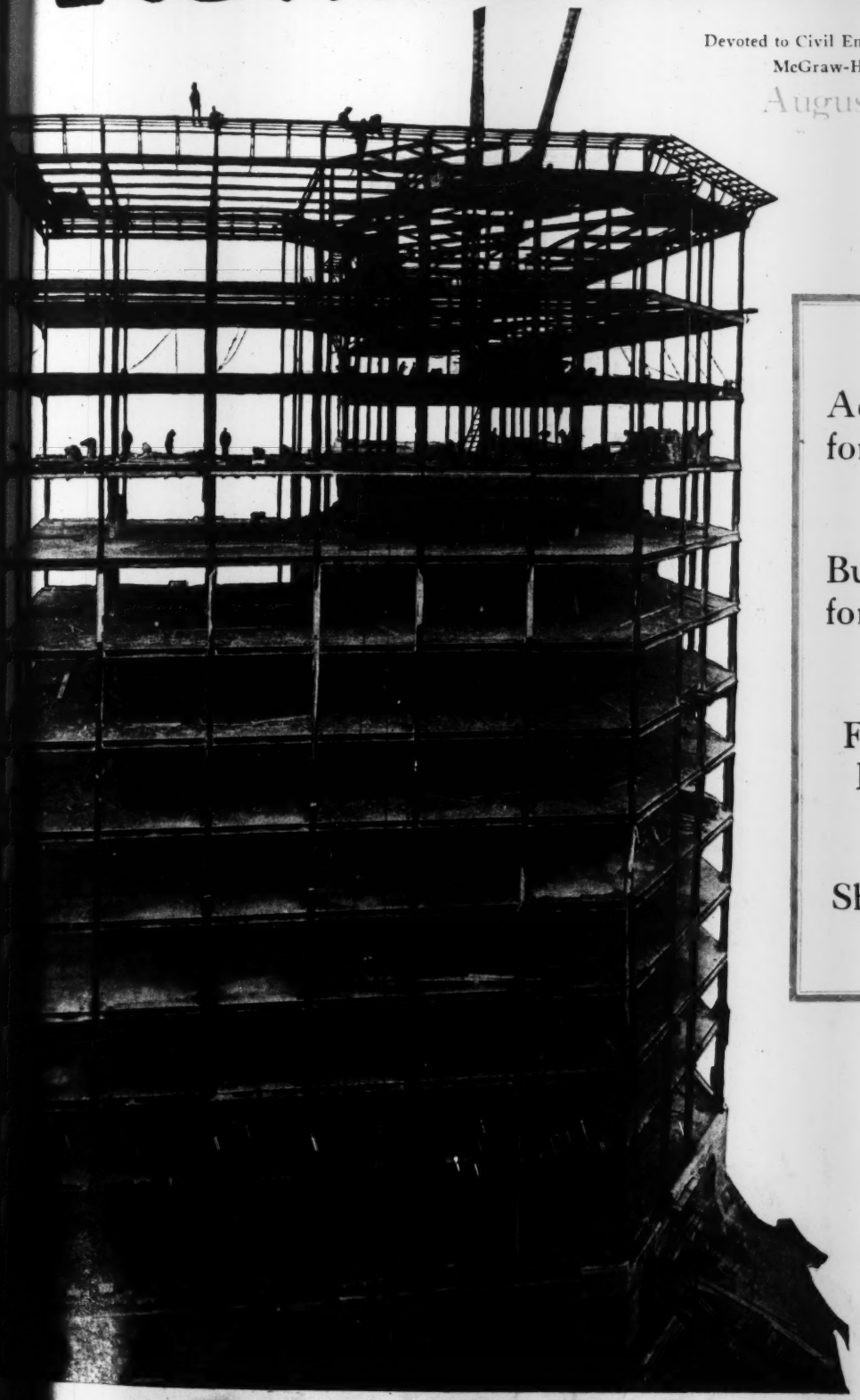
August 14, 1924



Office Building
Under Construction
at Richmond, Virginia
for Official State Uses

Mechanical Adjustment of Grade for Gravity Switching

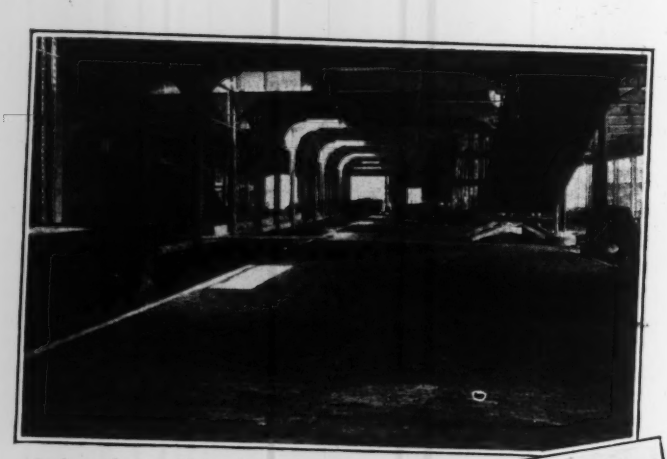
Virginia Builds Office Building for State Departments

Aerial Maps Facilitate California Home-Site Survey

Concrete Sheetpile Levee Wall at New Orleans

KREOLITE

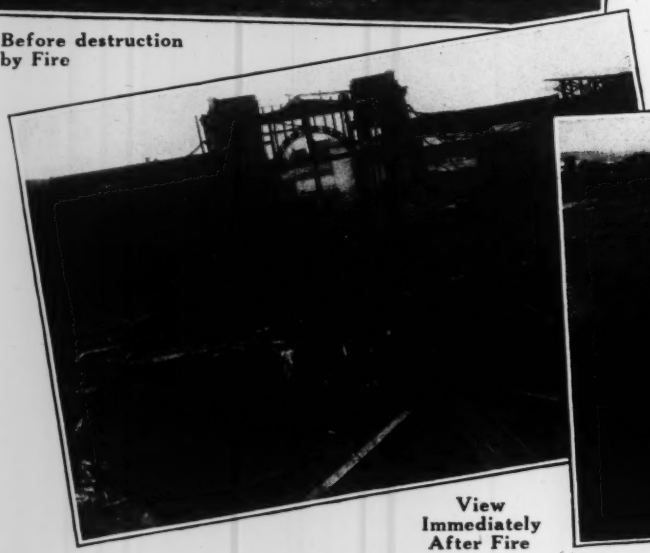
Kreolite Wood Block Floors Do "Outlast the Factory"



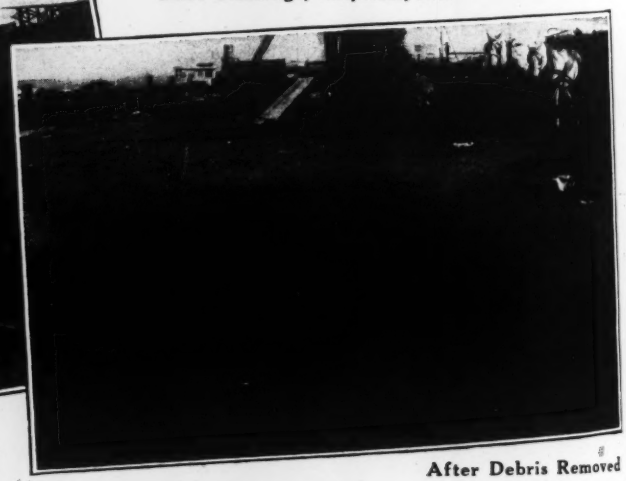
Before destruction by Fire

The Jennison-Wright Co.
Toledo, Ohio

Also manufacturers of Kreolite Redwood Blocks, the ideal flooring material for hotels, office buildings, hospitals, etc.



View Immediately After Fire



After Debris Removed

WOOD BLOCK FLOORS

A Consolidation of Engineering News, Engineering Record and The Contractor

ENGINEERING NEWS-RECORD

McGraw-Hill Company Inc.
JAMES H. McGRAW, *President*
E. J. MEHREN, *Vice-President*

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

FRANK C. WIGHT
Editor

Volume 93 NEW YORK, AUGUST 14, 1924 Number 7

Modernizing the Government Office

IT IS typical of the new spirit of the South that the first really modern state office building should be within a stone's throw of the capitol of the Confederacy. Virginia is to be congratulated upon its enterprise and initiative in getting away from the classic style—the embrasured window and high ceiling, the marble corridor and ornamental fireplace—that marks our public buildings. The business of conducting a state requires a business office and that Virginia has provided. It will be noted from the article on another page that the engineering services have been especially cared for, particularly as to laboratory equipment and layout. The Virginia building may well serve as a model for the other states to follow.

Special Parking Plans

AUTOMOBILE parking plans in downtown Washington, noted in our news section this week, have interest only to those cities which are equally fortunate as the capital city in having wide streets and large blocks near the downtown section. It is those two features that are to be used there to relieve traffic congestion by getting the parked automobile out of the way of moving vehicles. The wide street, such as K St. in Washington which it is proposed to make still wider, permits substantial center parking with parallel traffic ways. The interiors of the large blocks have hitherto not been utilizable except for undesirable alley dwellings, which are being eliminated, or for low warehouses and sheds. With plentiful alley access, which the Washington blocks have, this interior space lends itself admirably for either garages or open parking. Many of our Western cities have also those conditions of comparatively little traveled wide streets near the business district and large blocks with frequent alleys and they may be able to follow the example of Washington. For our crowded older cities, which did not have a l'Enfant to plan them but just grew, these parking possibilities have little to offer.

Toll Roads Redivivus

CONSIDERATION of trunk roads exclusively for motor vehicles appears to have gone farther in European countries than it has in America. England has been discussing several projects, the most notable being the London-Birmingham road, 100 miles, to be paved with concrete 50 ft. wide. A more important example, from the fact that it is proceeding rapidly with its construction, is the 55-mile Italian *autostrada* described in this issue. Like the proposed London-Birmingham highway, the Italian road is concrete paved. Both are toll roads financed and operated by private interests with government sanction and, in a limited way, government aid. Particularly three things are outstanding as characteristic of these foreign road developments: They are routes wholly separate from existing highways; they are speedways, i.e., paved roads without grade crossings, and they are private commercial enterprises. It is barely possible that some last-century American toll road still is operated; if not, the nearest similar highway in the United States is the recently completed Conners toll road through the Florida Everglades. An article describing the Conners enterprise will be published soon. Here it will be noted that, unlike the British and Italian projects, it is a general traffic route and not of speedway construction, but, like the foreign highways, it is a commercial enterprise operating under state sanction for profit. These three enterprises suggest the possibility of the revival of the toll road to meet other pressing conditions of highway traffic.

Will Bear Watching

A COMMITTEE whose work will bear watching and whose final report should be scrutinized with care was authorized by the New York Legislature in a last-days-of-the-session resolution and given $25,000 to spend. It is one of those joint legislative committees so dear and so common to American legislatures, appointed with due representation from both houses of the legislature and each political party, beyond which no consideration is given by the legislature to the qualifications of the members; a committee having to do with highly technical problems regarding which the chances are against any of the members being qualified by knowledge or experience. Apparently the primary purpose of the New York Committee is to devise some means of joint action by New York, New Jersey and Connecticut against the pollution of their common waters by oil, but this is tied up in the resolution with the pollution of those waters by sewage and further complicated by extending the scope of the committee's work to include "modernizing" of sewage disposal throughout New York State. The best that can be said for committees of this sort is that where a legislature is unwilling to call upon already existing, competent and well informed state administrative officials for advice on technical questions like water pollution a special legislative committee, although with much lost motion and needless expense, may serve as a guide, provided it will secure and follow competent engineering advice. Two dangers in the present case are: (1) that the legislative committee will spread out its work so thin that it can do nothing of material value either with oil pollution or sewage pollution, particularly if it goes into an attempt at "modernizing" sewage disposal throughout the state; (2) that it will be carried away with the theories of some idealist who advocates restoring the waters of the state, both tidal and inland, to their "pristine purity," regardless of municipal and industrial growth and of expense. This is why the work of the committee should be watched from start to finish and its report scrutinized by engineers and by intelligent public spirited citizens.

Reckless Words

COMMITTEES of both the Boston Society of Civil Engineers and the American Society of Civil Engineers have very justly, it seems to us, rebuked Major General Lansing H. Beach (retired) and Col. C. O. Sherrill of the Corps of Engineers for portions of their statements before the Joint Committee of Congress which was investigating the reorganization of the government departments. Both of these officers have been given an opportunity to explain some of their statements. So far as the record goes they have remained silent, and by so doing have only added to the unnecessary animosity between the civilian and military branches of the profession.

General Beach is the least offender of the two officers. His misstatement of the attitude of the Chamber of Commerce of the United States toward the Department of Public Works might readily have been due to misinformation. If it was, the only necessity is for the general to so state. His contention that the mainspring and motive behind the Public Works Department idea is the desire to foist the cost-plus method of contracting upon the government is a personal obsession which the late Chief of Engineers has been long known to hold. The charge is of that obscure and vague nature that cannot be conclusively proved or denied, but the evidence against it is sufficiently clear to those who have been acquainted with the campaigns for the Department of Public Works and who are unprejudiced by personal or class affiliations.

Colonel Sherrill's charge, on the other hand, is a most reckless one to come from a high officer of the army who holds, incidentally, the important position of military aid to the President of the United States. He repeats over and over that the building of the camps during the first year of the war by the Construction Division was accompanied by graft and undue waste. "Take for instance," he says, "the graft and absolute loss of funds through graft to the government of over eighty million dollars in building camps." Colonel Sherrill knows that for two years every such charge that has been subjected to judicial scrutiny has been thrown out of court. He knows, or ought to know, that the Graham Committee reports which he quotes as evidence were the preliminaries to a political and partisan campaign and have not the slightest claim to the respect of unprejudiced students of the charges. To state calmly before a congressional committee that the building of the camps was surrounded by graft shows, as the Boston committee very truly says, "a lack of that mental poise necessary to carry on engineering work of other than routine nature." It is not an excuse that these charges of graft are only incidental to Colonel Sherrill's argument for a qualified engineer reserve which could take over such work as the camp construction in event of war. Incidental or not the charges are there, and Colonel Sherrill, in justice to his own side of the argument, owes the profession either an explanation or an apology.

It is too bad that the case for and against the department of public works has degenerated into a fight about the Corps of Engineers. The American Society of Civil Engineers could do no greater service than to clear up the disaffection that this fight is slowly engendering. There are members of the Corps of Engineers who have not heretofore mixed in this controversy and who can be trusted to take a professional—and not a caste—view of the controversy. There are also civilian engineers who did not serve in the Construction Division and are therefore free from the partisanship that that service seems to have provoked. Can not the society make up a committee of such unprejudiced members who may be able to present to the profession a fair statement of this military-civilian imbroglio which will be non-partisan and, at the same time, clarifying?

Railroad Consolidation

LIKE A PAGE from railroad history of the days of the Goulds and Vanderbilts is the story of the development of the Nickel Plate System in the hands of the Van Sweringen brothers. Starting in 1916 with an unprofitable railroad some five hundred miles long they began building up a profitable system, first buying the Toledo, St. Louis & Western, then the Lake Erie & Western and more recently the Chesapeake & Ohio, which brought with it the control of the Hocking Valley. Meanwhile they were quietly buying up the stock of the Pere Marquette to give them feeder lines in Michigan and stock of the Erie to give them a second outlet to the Atlantic at New York. By early summer rumors of this new move were abroad but they were not confirmed until a few days ago when O. P. Van Sweringen came to New York and laid his cards on the table before the directors of the two railroads concerned.

Details of the merger are given elsewhere in this issue. The proposed new Nickel Plate System will rank fourth among the trunk lines east of the Mississippi and will enter into competition with the other three, the New York Central, Pennsylvania and Baltimore & Ohio. Such competition is in line with the consolidation provisions of the Transportation Act but the grouping of roads in the new system is not in line with the tentative plan of the Interstate Commerce Commission nor with the one which Prof. William Z. Ripley of Harvard prepared for the commission.

The commission used the Lehigh Valley as the stem of the system which included the Nickel Plate and the Clover Leaf, and Professor Ripley used the Delaware, Lackawanna & Western for the same purpose because of its excellent grades which made it a potential competitor of the New York Central once it was in the same system with the Nickel Plate; and its financial strength made it possible for it to put the Nickel Plate in condition equal to that of the parallel lines.

Including the Pere Marquette in the new system is more radical, however, than the other changes, for both the commission and Professor Ripley made it the backbone of an independent system in the Michigan peninsula. Professor Ripley did this because he considered that such an arrangement was the only way by which all the proposed railroad systems would have equal opportunity in that region. Evidently the Interstate Commerce Commission agreed with him for it made no important change in his plan. If the Nickel Plate is allowed to make the Pere Marquette part of its system then the Michigan Central and the Grand Rapids & Indiana will of necessity have to remain in the New York Central and the Pennsylvania systems and "System No. 6—Pere Marquette" of the Interstate Commerce Commission's plan will be eliminated.

The action of the commission on this first important move towards railroad consolidation will be watched with interest. It will have an important bearing on future voluntary consolidations.

Endurance and Failure

A REMARKABLE mass of data is being accumulated on the endurance, or resistance to fatigue failure, of engineering materials, principally steel. A large-scale investigation of this quality, conducted with brilliant resourcefulness, has been under way at the University of Illinois for several years. The Navy is conducting a parallel research at Annapolis, the Army Air Service another series of studies at Dayton, and in addition there are some other investigators at work on the subject so far as metals are concerned, while less elaborate work is in progress elsewhere in the concrete field. Certain basic facts about endurance are being established, by evidence more and more amply confirmed as the work goes on, and in a measurable period of years the main elements of the phenomena will be known.

Most of this work lies outside of the civil engineer's field. Problems of the design of machine parts brought about the present investigations. The field of static service, with which the civil engineer is mainly concerned, does not appear to be involved. Yet it may be taken as certain that endurance phenomena are closely enough related to the problems of the civil engineer that they are bound to claim his attention. He is concerned with the strength of material in every important aspect, and it would be quite unsafe to assume that because the civil engineer rarely deals with running machinery endurance strength is indifferent to him.

One obvious field of application of endurance studies is that of railway rails. Stresses in rails are high, and within the life of a rail they are repeated and even reversed a great number of times—comparable to the ten to one hundred million repetitions which represent the domain of fatigue. It is to be expected, therefore, that fatigue phenomena might be observable in rails. In harmony with this, certain kinds of rail failure have the typical appearance of fatigue fractures; and like such fractures they develop from obscure nuclei in the interior of the metal and have a definite relation to dirty and otherwise defective steel. It is highly probable that a close relation exists between general endurance phenomena and the phenomena of rail failures.

So far, the investigations have established the existence of an endurance limit in steel, that is, a limit of stress below which the material may be stressed repeatedly (in alternate direction, first tension and then compression) without fracture even after an indefinitely large number of repetitions. While this endurance limit appears to be about half the static tensile strength, or somewhere near the yieldpoint, its precise relation to the static testing-machine properties of the steel has not yet been defined in a satisfactory way. In general, the nature of fatigue failure is still the subject of speculation. There is much proof that defects of form or structure reduce the endurance limit. Surface indentations, sharp re-entrant corners and abrupt changes of form predispose to fatigue failure, as do also inclusions of foreign material and other internal defects. Whether superficial or internal, such defects are at present believed to favor fatigue failure by causing local stress concentration.

Two methods of increasing the endurance resistance are available: First, increasing the ultimate strength of the material, as by suitable tempering; second, subjecting the material to many repetitions or alternations of a stress well below the endurance limit. Both of these methods of improvement are rather unexplained. The first may be understood on the view that as the material is made stronger, the stress required to start the progressive tearing apart of the specimen must be greater. The second method of improvement is less easy to understand; it has been explained on the theory of internal readjustment, or relief of initial stresses.

Contrasting fatigue action with the effect of static loads, students of endurance phenomena have emphasized the noteworthy fact that, while in the case of repeated or alternating stress any concentration of stress is of critical importance, on the other hand under steady load local overstress is harmless. Brittle material is an exception, for here a local overstress is dangerous even in static service. But brittleness is a relative term. Every material is brittle in some degree, and so long as the nature of brittleness is unknown, and methods of measuring brittleness are unsatisfactory, the claimed distinction between ductile and brittle material does not furnish much help in general thinking about the relation of fatigue failure to civil engineering. It is possible that local overstress in static service may be important with any material, whether brittle or ductile.

The distinction between static and dynamic service as to fatigue effect is at best only an empirical observation, whose meaning is not fully intelligible until more is understood about the particular way in which the fracture of a piece of metal happens. On the surface there appears to be a thoroughgoing difference between static and dynamic service. But in the strict sense of the term, perhaps no piece of material is subject to pure static service. Slight variations of stress, more or less rapidly repeated, occur in every structural member constantly. And here the researches into the relation between fatigue failure and range of stress which have occupied some of the investigators during the past year become important. Test results already make it certain that, as the upper stress-limit of a variable stress is increased, a smaller range of the variable stress suffices to produce fatigue fracture; and it may be inferred that at some limiting point, which appears to be near the elastic limit of the material (but apparently above the proportional limit), the critical range of stress becomes negligibly small. This conclusion, if finally confirmed, will mean that the limiting point in question, or let us say the elastic limit of the material, should be regarded as the critical limit of stress even in so-called static service.

Another question involved in the distinction between static and dynamic service is that of form of member offering best resistance to failure. The results of endurance tests so far have shown that abrupt changes of section, unfilleted corners and the like, scratched or indented surface, lower the endurance strength decidedly. It is a quite general conclusion that all designing of machine parts should take careful account of these deductions. On the other hand, structural design in the field of civil engineering has generally been conducted on the assumption that the refinement of form required in machine design is an unnecessary trouble, and that sharp re-entrant corners, for example, are unobjectionable with regard to strength. But it may be that such beliefs as these also will require revision when the subject of fatigue failure is fully explored and its bearing on both "static" and dynamic stress service is thoroughly understood.

One of a Series of Articles on the Details of Design and Layout of Different Types of Industrial Buildings

Virginia Builds Office Building for State Departments

Laboratory, Office, Court Rooms, Stock, Storage and Files, All Specially Provided for in Office Type of Structure — Details of Special Fittings for Special Uses for Laboratories

SPECIAL needs of the different departments of the state of Virginia housed in the newly-completed 12-story, steel frame office building at Richmond were all considered in the plans, the construction and character of material utilized. Original plans called for an 8-story building on the southeast corner of the Capitol grounds on foundations capable of eventually suporting four additional stories, but unusual growth of the departments before the building was well under way led to construction to the full height, an extra session of the legislature being called to make this authorization for the $350,000 additional cost. This brought the total cost to $1,350,000.

FIG. 1—VIRGINIA STATE OFFICE BUILDING
Shape of ground floor plan with re-entrant angle makes structure remarkably free from vibration.

Most of the state departments can be accommodated in typical office space. The Board of Education, Vital Statistics, Purchasing Department, etc., needed no special treatment but the Industrial Commission and the State Corporation Commission had to be provided with court rooms and conference rooms for their purposes. Others, such as the Highway Department with its testing laboratories, the Health Department with its biological laboratory, the Veterinary Department with its various disease-preventing serum cultures and the Department of Agriculture, with its extensive chemical laboratories, required special space and equipment.

Laboratory Layout—These laboratories were provided with soapstone sinks with drain lines run of duriron, an acid-resisting metal. This special service called for separate lines from the twelfth floor, where the chemical laboratory is located, to the basement, and was an expensive installation. The floor of the laboratory on the twelfth and that on the sixth floor for the Health Department, were of magnesite on a concrete base, decided upon after the chief chemist had made exhaustive tests on various samples of similar flooring. The flooring of the large chemical hoods is of fiber mastic, the partitions between the hoods being of hard tile laid up in acid-proof mortar and painted with acid-resisting paint. Each hood vents through the roof by means of a terra cotta pipe. Tops of all desks and tables, acid-treated by the formulas given in the accompanying table, presented a satisfactory acid-proof black finish.

In the laboratory for the Board of Health on the sixth floor is a refrigerating room with separate refrigerating plant to maintain a constant low temperature to retard germination while adjacent is a hot room to promote cultures. The temperatures are regulated so as to maintain whatever constant temperature is required.

On the third floor the Board of Moving Picture Censors has a projection room with two machines erected on a steel platform. Everything in this room is of fireproof material, the floor being of terrazzo and the doors kalamein. There are two blower fans for ventilation.

The Highway Testing Laboratory in the basement contains testing machines for various materials, a grinding machine and sand trap, chemical laboratory, balance room, damp room and general office rooms.

On the twelfth floor where the chemical laboratory is located, the story height was increased from 12½ ft. to 16½ ft. to allow for the fume hoods. The basement story was made 13 ft. 1½ in. and the first story 15 ft. 9 in. for architectural reasons.

Floors and Walls—In the basement is the machine room which is 5 ft. lower than the other floor level to allow pipes to run concealed underground in a special pipe tunnel to the pipe shaft near the elevator hatchway. Excepting in the laboratories all pipes are concealed in the walls or in the pipe shaft. The walls are furred with tile for this purpose as well as for dampproofing.

In the machine room are found the ammonia compressor for the drinking water system, the air compressor for the laboratories, the hot water generator, house pumps, drinking water pumps, vacuum pumps for the heating system, surge tank and switches controlling the light and power circuits. The floor of the machine room was waterproofed by using 5 per

FIRST COAT FOR TABLE AND DESK TOP TREATMENT

Potassium chlorate	35 grams	Bring to a boil, continuing heat if necessary until all the potassium chlorate and bluestone are dissolved. Stir well and with a mop or brush apply one coat while hot. Let dry.
Bluestone	50 grams	
Water	1 liter	

SECOND COAT

Analin	50 cu.cm.	Make up to one liter with water. Apply one coat and allow to dry. Then apply a second and allow to dry. As a third coat, apply paraffin oil and after three days wash off the excess oil with a hot soap solution.
Hydrochloric acid	100 cu.cm.	

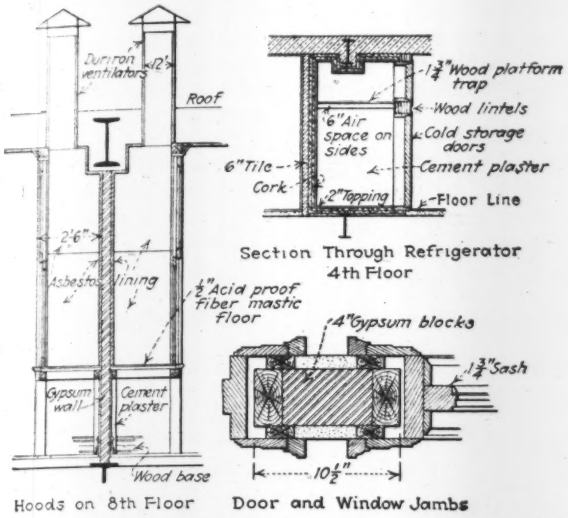


FIG. 3—DETAILS OF HOODS, SASH AND REFRIGERATOR

cent hydrated lime in the concrete mix and drain tile laid under the floor. The exterior basement walls are of granite with limestone above to the third floor sill course, then buff pressed brick to the eleventh story lintel course with the twelfth story and cornices in architectural terra cotta in attractive design. All office rooms are outside rooms having rift pine floors with wood trim of birch finished in mahogany. The elevator lobbies have marble floors while the corridors have terrazzo floors. The two stairways have safety nosings on steps with treads and landings covered with battleship linoleum.

Fire Protection—For fire protection there are two 4-in. fire risers at the two stair wells leading from the siamese connection at the street to the pressure tank on the roof. These risers, however, are dry lines, the architects believing that this system is much more dependable than the wet riser. In the wet system the riser is full of water fed from the tank and a rubber or canvas hose is placed on each floor connected to the riser. Experience has shown that it often happens that the hose being unused for a number of years becomes rotted. In the dry riser no hose is connected or even bought by the owner, but when the alarm is sounded the fire department connects its engine to the siamese and pumps into the riser from the street. The building's own hose is connected at the floor upon which the fire is located. In addition to the fire risers there are three fire extinguishers placed in the corridors of each floor, one for every 2,500 sq.ft. of floor area. This installation has reduced the cost of fire insurance about 5 per cent.

In order to take care of the heat and power requirements of the new building the state power plant was

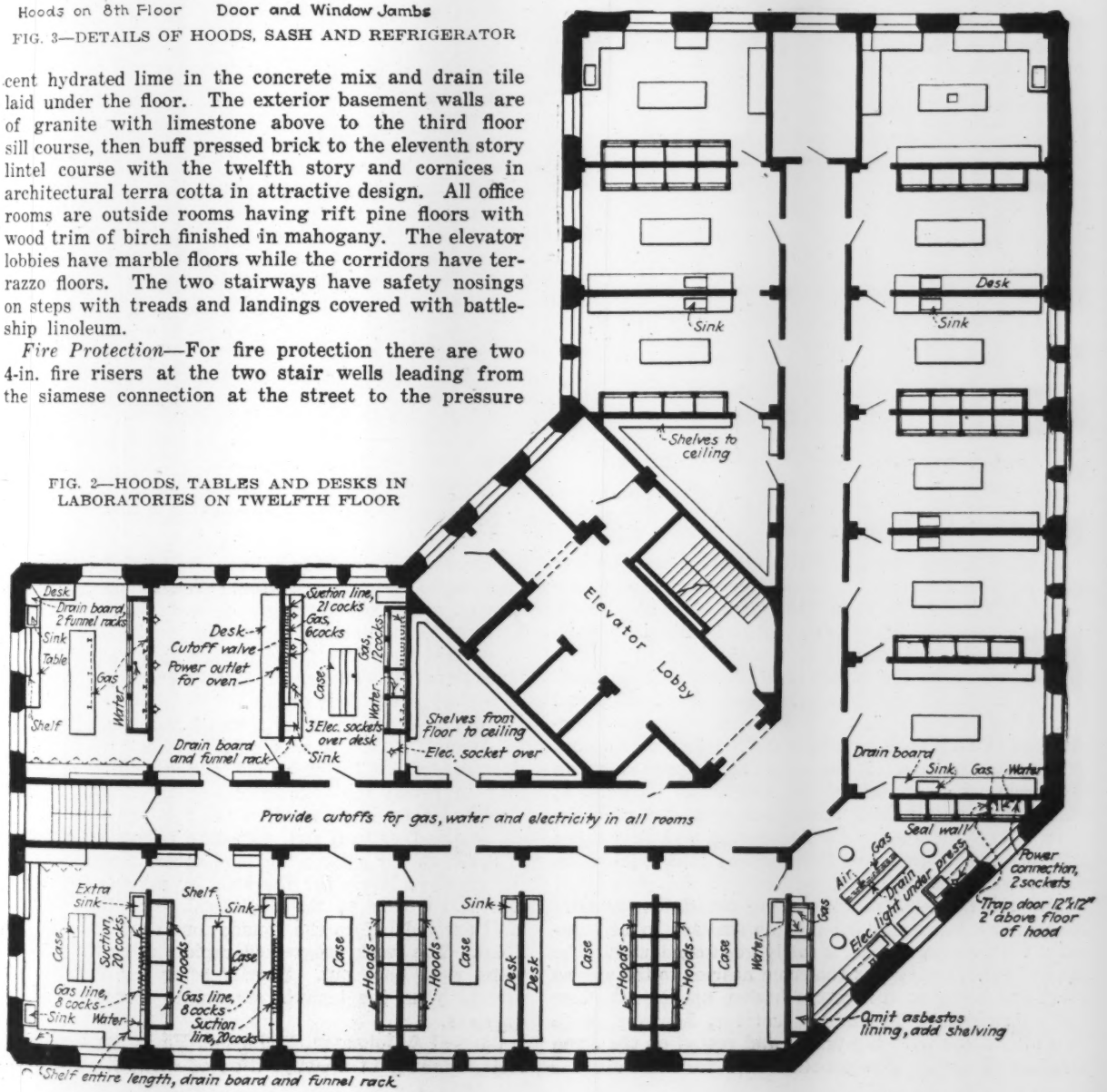


FIG. 2—HOODS, TABLES AND DESKS IN LABORATORIES ON TWELFTH FLOOR

enlarged; two new 250-hp. boilers, one motor generator set and one engine-driven generator were installed. The motor generator set is a duplicate set to use alternating current from the outside source and generate direct current for use on the capitol grounds in case of a breakdown within the plant. Automatic stokers were installed with the boilers and the plant modernized.

Engine Vibration—An interesting feature developed in the new engine-driven generator, which was the main equipment for furnishing current. The exhaust steam from the engine is used to heat the buildings. When the engine was tested out it was found to run smoothly in the power house and little vibration was noticed. However, the state library building which adjoins the power house began to vibrate in unison with the strokes of the engine. The book stacks began to set up a tattoo which could be counted and corresponded with the revolutions exactly, window weights rattled, water in the water bottles was seen in commotion, mirrors seemed to have the heebie-jeebies and the state librarian and employees all became panic-stricken to such an extent that the building was devoid of tenants for that afternoon. This happened on an afternoon when an earthquake shock was recorded at Washington and it made those not acquainted with the causes very apprehensive. The engine was shut down and the chief engineer of the company that erected the engine was sent for.

The soil upon which the engine foundation rests is a hard blue marl and the hillside appears to be saturated with water, making a fairly good conductor. The annex of the library was the room nearest to the engine room but being on a stratum higher up did not show any vibration. The library footings, however, were in a direct line with the piston and rested on the same stratum of soil. The problem was to eliminate the vibration in the engine itself by counterbalancing it as perfectly as possible. After calculations were made lead weights were applied to the flywheel until 70 per cent of the reciprocating parts were balanced, the valves were adjusted, the speed cut down slightly and the flywheel itself trued off by an emery wheel and further tests made. The vibrations have been almost entirely eliminated and are only noticeable in some high metal book stacks on the third floor nearest the engine. Further adjustments are now being made which it is believed will entirely remove the trouble.

Building Erection—In the construction of the building safety devices such as patent scaffolding were used in setting the brickwork. Two outside hoists were erected for taking up materials, one in each wing. Cinder concrete for the floor fill was mixed on the ground and taken up in wheelbarrows to the various floors. In pouring the gypsum floors fast time was made, a floor being poured every three days. The outside brick walls went up at the rate of a story every four days.

Work of clearing the site was begun the latter part of August, 1922. It was quickly discovered that the site covered a fill over an old ravine making it necessary to revise the foundations considerably. As the steel had been in fabrication the footings were placed on accepted natural soil, tested to a bearing capacity of 3,000 lb. per square foot and concrete poured up to the required levels for the steel by means of concrete plinths. Owing to the additional work involved the steel arrived before the foundations were entirely finished. The work progressed rapidly after the revised plans were once out. Shortly after the first of the present year the tenants started to move into their quarters.

Carneal & Johnston, Richmond, Va., were the architects, winning in a competition of designs. The John

FIG. 4—FOOD CHEMICAL LABORATORY

Wood table tops are treated with acid-proof preparation. Hood partitions are hard tile laid up with acid proof mortar and the flooring is of fiber mastic.

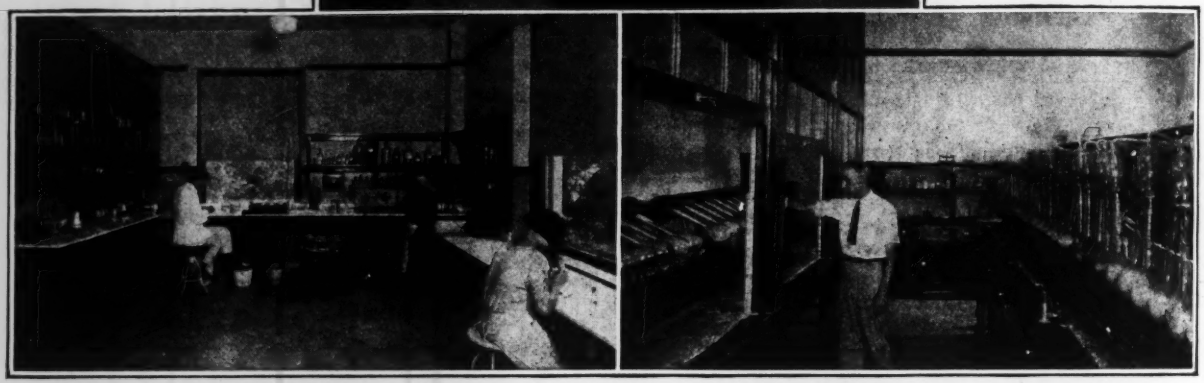


FIG. 5—BACTERIOLOGICAL LABORATORY OF BOARD OF HEALTH

Floor of magnesite on concrete base used after exhaustive tests by chemist. Non-absorbent tables of white glass used due to nature of work.

FIG. 6—FERTILIZER LABORATORY, NITROGEN ROOM

Banks of distilling apparatus for nitrogen determinations on right are served with special lines of gas, water and drains. The table top is protected by a layer of sheet asbestos.

T. Wilson Co., Inc., of Richmond was the supervising contractor, for whom C. E. Dexter was superintendent. The latter, who furnished the information for this article, states that no employee was seriously injured

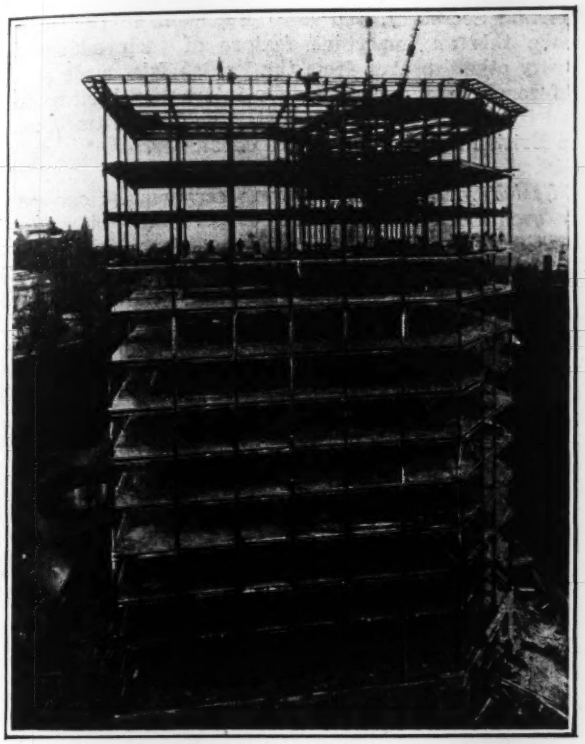


FIG. 7—VIRGINIA STATE OFFICE BUILDING UNDER CONSTRUCTION

On completed floors bricks for walls, window frames and partition material were stored previous to placing. Shape of building made vibration so small sensitive laboratory balances on the twelfth floor were unaffected. Vertical service pipes appear as rods.

throughout the entire job and that due to the shape of the building it braced itself against vibration so that the sensitiveness of the laboratory balance in the upper stories are not affected.

Extension of Viaduct Roads in London

Many of the south London railroad lines are carried by viaducts through the more congested areas, such as those south of London Bridge station and through the densely populated districts about the south side of the river, and this principle applied to a roadway forms one item of the Port of London Authority's scheme of development. The viaduct road is to extend from the city to the Victoria docks and is estimated to cost £3,000,000. In an interview a highway authority says that the great arterial roads in London, for their ultimate use to the best advantage, demand that more satisfactory roadway facilities shall be established in the city itself, and it is obvious that little can be hoped for unless wedges are driven through the congested areas as in Kingsway and Aldwych. There is also something to be said for the suggested conversion of the London canals into roadways, though these are capable of considerable development as carriers of freight. The new viaduct roadway would carry all the freight traffic from the city wholesale houses direct to the docks.

Slow Sand Filter Converted to Mechanical Type at Putnam, Conn.

A SMALL slow sand filter at Putnam, Conn., which had been outgrown in capacity and did not meet the increasing demands of later years for color reduction has recently been converted into a mechanical filter plant with a larger daily capacity and producing a water satisfactory in color. By utilizing a considerable portion of the walls, columns and groined arches making up the structural part of the three old slow sand filter beds with a combined area of about ¼ acre and of a clear water basin with a capacity of 200,000 gal., and by omitting "all apparatus, such as gages, operating tables, etc., not absolutely essential to the operation of the plant," the old plant of perhaps 0.5 to 0.75 m.g.d. capacity was converted into a 3-m.g.d. mechanical filtration plant at a total cost of $41,000. The new plant has been in satisfactory operation since Sept. 15, 1923. The engineers for the new work were Henry A. Symonds and Fred L. Stevens of Boston. H. W. Clark, chief chemist, Massachusetts Department of Public Health, acted as consultant on portions of the design. The structural work was done by the city on force account under the supervision of Mr. Stevens. The filter and chemical equipment were supplied by the New York-Continental-Jewell Filtration Co.

The original water-works of Putnam were built in 1885 by the Putnam Water Co., with William Wheeler, of Boston, as consulting engineer. Judged by present-day standards the water was unsatisfactory from the start, but it was not until 1906 that purification works were built.

In October, 1913, the water-works were taken over by the city. Consumption had then reached an average of 0.95 m.g.d. and a maximum of 1.5 m.g.d. and over, making it impossible to filter all the water when one bed was out of service for cleaning. War and post-war conditions deferred remodeling the purification works until 1922 and necessary economies forced the city to carry out the improvements with the least possible expense.

The six mechanical filter tanks were placed in the center of the old structure, chemical mixing chamber and accessories at one end, and heating plant, coal storage, and various mains leading from the pipe gallery at the other end. There is a central pipe gallery with three filter tanks on either side, and above the gallery is the operating floor. To house the operating floor, chemical room, and a part of the beds, a plain building, consisting of 12-in. brick walls and a wooden hip roof, was built after removing the old groined-arch roof over this part of the plant.

Owing to the varying rate of filtration resulting from the variable operating head due to rise and fall of water in the clear-water basin, it was necessary to provide automatic feed for the alum solution, and this was accomplished by means of special apparatus designed by the contractors for the filter equipment, consisting essentially of a needle valve having its opening controlled by the differential pressure at the venturi tube in the raw-water line.

The old and new filters are described and illustrated by Mr. Stevens in the *Journal* of the New England Water Works Association for June, from which the above notes have been taken.

Notes from Foreign Fields

England—Five Years After the Peace

By E. J. Mehren
Vice-President, McGraw-Hill Co.

THE WAR is past history in America, but current history in Great Britain. So, indeed. it seems after spending a week in Britain's capital, conversing with her men of affairs and listening to addresses by her business leaders and statesmen. True, there are war scars in the United States, scars that will never be erased. We are mindful of the men who died in the great struggle; we have great numbers of disabled veterans. On the financial side we still have, and will have for many years, a war-swollen budget and correspondingly increased income taxes. But, by and large, the war shadow has thinned out. In the last two years we have had "good times." Our war-time income tax rates have been twice reduced. Certainly the way is not blocked by serious obstacles. The difficulties we foresee are merely the fluctuations that, except for "panic years," are normal to business.

Not so with Britain. The war is only a yesterday with her, and the consequences are still sharp upon her. I do not mean that she is discouraged; that word has no place in the British vocabulary, nor has the state of mind it indicates any place in British consciousness. But the burdens that weigh her, the obstacles still to be overcome, are fully appreciated and are a stock subject of discussion with all her thinking men.

To enumerate some of the troubling factors:

1. There is still large unemployment—though the amount is lessening.
2. There is marked depression in the "engineering trades," as they are called here—shipbuilding, machine tool building, and the metal fabricating industries generally. In construction there are few large projects in hand, though there are a few that, after long delay, now seem likely to be taken in hand.
3. A new housing bill, that will again dip heavily into the national and into local government treasuries—and increase, accordingly, national and local tax burdens—is before Parliament.
4. The income tax rate on even small incomes is 4 shillings 6 pence per pound sterling, or 22½ per cent. The super-taxes are very heavy.
5. The Continental problem is acute and the consequent uncertainty, upset exchanges, diminished purchasing power, curtail British export markets.
6. Finally, the never-ending exchange of views, with their Continental war allies, on German reparations keeps before the British people constantly the fact that peace, though declared five years ago, is not yet here. There is cessation of military activity; there is not that accord which is peace in actuality.

That the consciousness of the international element in these difficulties is ever present with the thinking Britisher was strikingly demonstrated at the great advertising convention held here, at the British Empire Exhibition, last week. There were delegates from every country, though the United States sent the largest representation, 1,700 (including the ladies). To this great convention, man after man emphasized the distressed position of Europe and expressed the hope that out of the international discussions now under way in London, and participated in by the United States, there may come that peaceful adjustment for which Europe has been longing since that wonderful Nov. 11, 1918. Winston Churchill, Sir Robert Horne, J. H. Thomas, Colonial Secretary, and Lord Burnham, in particular, made this an important feature of their addresses. Every other speaker from the British Isles made some reference to the unfortunate international situation, and its effect on British industry, on British trade, and on British social and political conditions.

Social Conditions—In private conversation one gets an even more serious picture of England's difficulties, for there the talk turns to social conditions. Briefly, the burden of these conversations can be reduced to just this: that the altruistic promises of war times and the coddling of politicians have taken from the mass of British workers a sense of responsibility for their own welfare and led them to expect the government to take care of them. Thrice, indeed, was the statement made to me, and in separate conversations, that there was a growing opinion, fostered by socialist agitators and politicians, that if the people would have the babies the government would do all else.

Such an attitude, of course, leads, and has led, to shiftlessness, inefficiency when at work, failure to provide for the rainy day—in a word, all of the economic vices of a dependent, spineless people.

The worst of the difficulty is that no one with whom I have spoken about this attitude of the people seems to have any hope for early improvement. The politician—not the statesman—is the ruler of the day, and, as with us, he does not hesitate to sell the public treasury in order to advance his personal interests.

Withal, though, it should be repeated that the Englishman is not discouraged. He has lived through a lot. He hopes that he will live through this trying period, and that a better day will come.

His way is not our way. We would think that his more or less complacent attitude might be fatal. He believes that the situation will turn out all right; we would fear that it would turn out all wrong unless vigorously handled. (One recalls our Unemployment Conference of some years ago.) We, I hope, would turn, so long as possible, to private measures of relief. The British have turned to the government. The difficulties, of course, were very great; the amount of unemployment, for example, was quite large. Possibly with similar conditions we would have been forced to a similar solution, but I am inclined to believe that the British tap the national treasury with less hesitation than we. The actual war, let us recall in possible explanation, lasted more than twice as long for them as for us.

But though our methods might differ from those of the British we cannot withhold our admiration of their sterling qualities. Similar conditions would put us in a panicky condition. They go on hanging out their sign "business as usual," confident all will eventually be well.

Looking back on their long and brilliant history, we, too, can feel confident that somehow the Briton will come out on top. Trial and difficulty develop stamina and character. They are developing them right now in business circles. In the wage-earning classes the tendency is in the opposite direction. Eventually, under the example of conscientious leaders, even that tide should change.

London, July 19, 1924.

Concrete Sheetpile Levee Wall at New Orleans

Bulkhead of Tongued and Grooved Piles Jetted Down and Grouted Avoids Raising River Levee and Wharf

By W. M. Peters
Assistant Chief Engineer, Woods Brothers Construction Co., New Orleans, La.

LARGE reinforced-concrete sheetpiles, jetted into place and covered with a reinforced-concrete cap, have been used by the Illinois Central R.R. in building a bulkhead for about a mile along the river front adjacent to its Stuyvesant Docks at New Orleans, La. Additional protection against high water has been required by the New Orleans Levee Board, and this bulkhead construction was decided upon, in preference to an earth levee, in order to meet the requirements without necessitating an excessive raise of the loading tracks along the rear of the dock or wharf. Such a marked change in the elevation of these tracks would have required a corresponding raise in the wharf and other facilities, in order to maintain the existing relation between elevation of tracks and wharf floor. This concrete wall is shown in Figs. 1 and 4 and a typical cross-section of the wharf in Fig. 2.

The dock sheds are built on creosoted piling over the river slope of the old levee, with a line of wood sheetpiling at the top of the slope. Since a watertight wall is formed by the new bulkhead along the land side of the wharf, with its top about 6 ft. above the original crest of the levee, it was not necessary to raise the dock floor and adjoining loading track more than 18 in. To make this raise and bring the wharf floor level with the top of the levee wall, creosoted 12-in. cubes were spaced 30 in. apart along the old floorbeams and upon these were laid timbers 6x12 in. supporting the floor joists. This blocking is shown in Fig. 1.

The concrete sheetpiles, Fig. 3, were built in accordance with the railroad company's design, modified to accommodate the use of the Bignell jet system. Each pile is 25 ft. 1½ in. long, 3 ft. wide and 10 in. thick. The lower end is beveled (except that the first or starting pile has a flat end) and the edges are formed with tongues and grooves, as shown. When in place after jetting, a beveled tongue on each pile extends 2 in. into a groove 4 in. wide and 4⅛ in. deep in the edge of the adjoining pile, leaving a 2-in. space to be filled by grouting. A 1:2:4 concrete mix was used for the piles, and in addition to the steel reinforcing each pile had two wrought-iron loops at the top for handling. A 4-in. jet pipe extends the entire length of the pile and ends in a 2-in. nozzle at the bottom. Nine ½-in. laterals branch

FIG. 1—BULKHEAD OF CONCRETE SHEETPILING AT NEW ORLEANS
Piles jetted down along rear of wharf; floor raised by blocking under wood joists.

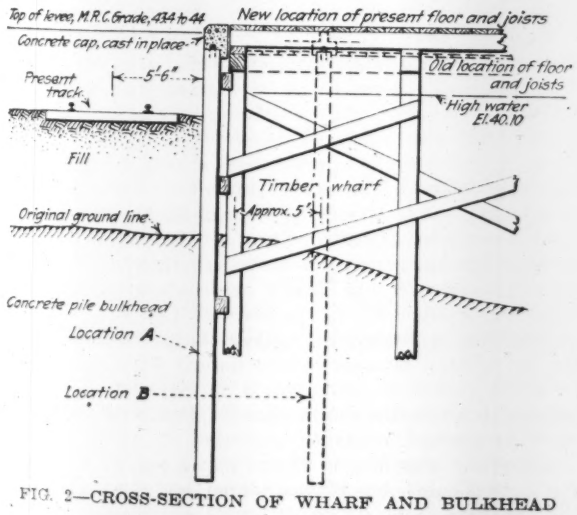


FIG. 2—CROSS-SECTION OF WHARF AND BULKHEAD

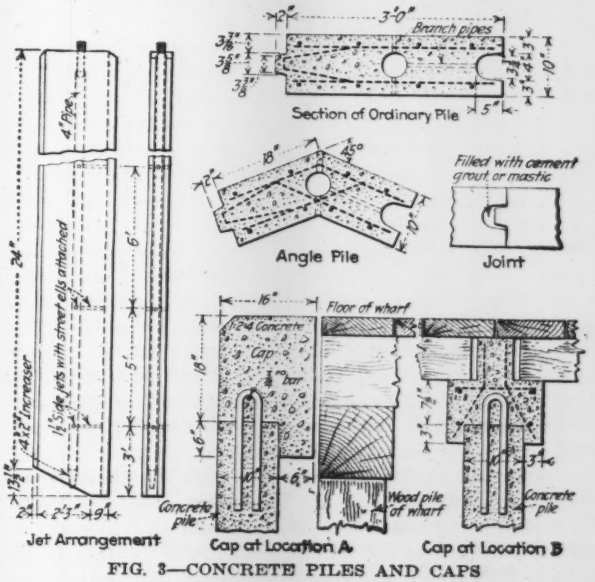


FIG. 3—CONCRETE PILES AND CAPS

out from this pipe at various heights, ending in elbows which divert the water upward along the surface of the pile. Six of these branches open at the sides of the pile, while three of them open into the groove so as to keep the joint clear while sinking. The piles were made in the railway yard adjacent to the site of the work.

For jetting, a floating plant was used consisting of a barge equipped with two boilers and steam pumps, each unit having a capacity of 1,000 gal. per minute at 200 lb. pressure and one unit being kept in reserve. From the barge a 4-in. hose line was carried across the wharf and coupled to the jet pipe projecting from the pile head. A locomotive crane on the track adjacent to the wharf handled the piles. Logs and old timbers were broken by means of a 15-in. I-beam driven by a steam pile hammer, but at some points it was necessary to build small cofferdams to remove obstructions, the openings being closed by concrete poured in place.

For grouting the joints, the equipment consisted of a 3-in. pump, a water tank and a barrel for the grout. A double connection at the suction end of the pump permitted feeding either the water from the tank or the grout from the barrel through the pump. On the discharge end of the pump was a 2-in. hose attached to a 25-ft. length of 1-in. pipe. In sealing a joint, the

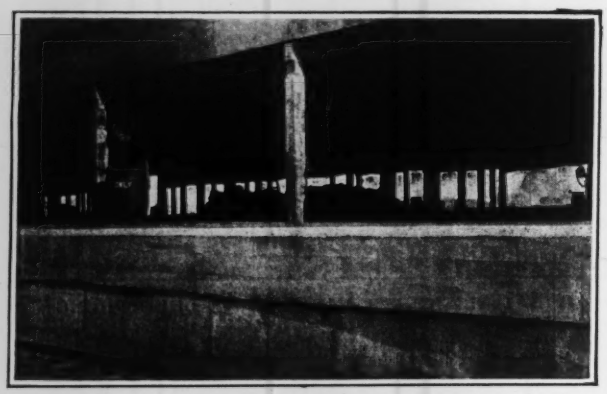


FIG. 4—COMPLETED WALL WITH CONCRETE CAP CAST ON SHEETPILES

1-in. pipe was inserted in the groove and water was turned on to wash out all sand and mud. Then the neat grout was pumped in while the pipe was raised gradually until the grout had reached the ground level. Above this level a 1:1 mortar was poured in from a bucket through a funnel and was stirred with a rod. The 4-in. jet pipes in the piles were closed in the same manner. Expansion was provided for at intervals of 50 ft. by filling a joint with asphalt instead of with grout and mortar.

After sealing the joints, a reinforced-concrete cap 18x16 in. was cast in place over the tops of the piles, tying them together and strengthening the levee wall. Along that part of the wall which was in front of the platform of the wharf, the cap formed a curb or coping as shown in Figs. 3 and 4, but along that portion of the dock where the wall was under the floor of the platform the cap was made with shoulders to support the floor joists.

The design and construction of this bulkhead were under the direction of F. L. Thompson, chief engineer; F. R. Judd, engineer of buildings; and C. I. Anderson, assistant engineer of buildings, Illinois Central R.R.; with L. S. Marriott as resident engineer in charge. The contractor was the Woods Brothers Construction Co., Lincoln, Neb., which holds the patent rights for the Bignell piles; the work was done under the superintendence of W. M. Peters, assistant chief engineer of that company. Construction was begun in November, 1923, and completed in March, 1924.

Court Holds Permit No Defense for Creation of Nuisance

AS THE outcome of a recent suit in California over the pollution of river waters by sewage, the court held that a permit from the State Board of Health authorizing discharge into the stream does not relieve the permit holder of responsibility for nuisance created in operation under the permit. This point was clearly established apart from the fact that in this instance there was no nuisance and hence the defendant was not guilty.

The original action was brought in the superior court of California by the district attorney of Kings County, to prevent the city of Reedley from discharging sewage effluent into Kings River on the grounds that the waters were being polluted and made unfit for use and constituted a menace to the public health. The defendant set forth that a permit issued by the State Board of Health authorizing this means of disposal was in full force and unrevoked and, in addition, that the effluent prior to its discharge had been treated and rendered harmless and uninjurious to the public health. Judgment was rendered that the city was not creating or continuing a nuisance. An appeal was taken to the appellate court based on the contention that the permit issued by the State Board of Health to the city of Reedley constituted no defense and that the testimony submitted was insufficient to support the findings of the court.

Permit Not a Defense—The appellate court upheld the first contention and ruled that "a permit issued by the State Board of Health . . . authorizing a city to discharge sewage effluent into a river, and unrevoked at the time of the trial of an action to abate as a public nuisance the discharge of such sewage and other deleterious substances into said river, does not authorize a city to create or continue a nuisance, or in any wise limit the power of the court to abate the same, in the event it finds that a nuisance exists or is being created and continued under the claimed authority of such permit."

However, the appellate court further declared that the findings of the superior court were based, not on the fact that such a permit was in existence but on conclusions formed from the testimony, which showed that the effluent was rendered harmless before being discharged and that the city of Reedley was not maintaining a nuisance. The court further ruled that, there being sufficient testimony to sustain the findings of the trial court, the latter's ruling in the matter of the defense offered in regard to the certificate issued by the State Board of Health was wholly immaterial "because, if the city at the time of the trial was not maintaining a nuisance, whether the proceedings leading up to the issuance of the permit were regular or irregular, valid or void, would in no wise affect the judgment which the court should enter when it found that no present nuisance existed."

A petition was filed in the supreme court for a hearing in that court, but it was denied, and the decision of the appellate court stands as final.

Chief of Engineers' Views on Lake Harbor Deepening Costs

General Taylor Makes Stand on Great Lakes and St. Lawrence Clear—Latter Development Declared Only Matter of Time

Washington Correspondence

SINCE extracts quoted from a letter written recently by the Chief of Engineers in response to an inquiry as to the cost of deepening lake harbors have been interpreted as indicating General Taylor's opposition to the St. Lawrence project, he has authorized the publication of the following statement:

"With reference to certain questions propounded relative to the deepening of the channels and harbors of the Great Lakes, I regret to advise that it is not possible to make even a rough estimate of the cost of such deepening without extensive surveys. The material of which the bottom of the harbors and channels is formed varies from soft mud, which can be excavated at a cost of a few cents a yard, to hard rock and boulders, costing several dollars a yard to remove.

"In many places where the bottom now is composed of mud or soft material, it is practically certain that boulders and rock will be found beneath the present bottom before the additional depth of 14 ft. (necessary for a 35-ft. channel depth) would be reached. I would not want to venture even a guess as to what the cost would be. It can be stated, without possibility of error, that it would run into a great many millions of dollars. Not only would this extensive dredging be required, but the reconstruction of the locks at St. Mary's Falls, and very probably the provision of regulating works in the rivers between Lakes Superior and Huron and between Lakes Huron and Erie, also would be required. The third and fourth locks at the Falls of St. Mary's have 24 ft. over the Miter Sills at standard low water. The other locks have less than this.

"There is nothing impractical in deepening the channels and harbors to 35 ft. No work of an unusual character or different from that which already has been accomplished on the Great Lakes would be required. It is merely a matter of cost.

Tieup With St. Lawrence Project—"I do not think there would be use for 35 ft. on the Great Lakes unless a corresponding depth were provided in the St. Lawrence River. Practically all of the waterways and harbors on the Great Lakes have been improved to a depth of 21 ft. As a result of this uniform depth, the cargo carriers have been designed for economical operation in this depth of water. Transportation costs on the Great Lakes are very low and freight probably is handled as economically as any place in the world. It is possible that with a greater depth, such as 35 ft., still larger cargo boats could be built which would carry the commerce for a slightly less cost per ton-mile than do the present boats, but the difference in cost per ton-mile necessarily would be very small, and the great cost of producing the channels could not be returned to the shippers in a great many years, if ever.

"At the present time all of the lakes are very low, and the boats which could operate economically with 21 or 22 ft. of loaded draft are obliged to load to somewhat less draft with a corresponding loss in net earning capacity to the lake carriers, but I hope this lowering of the lakes is a temporary condition and that the water will return to its normal level.

"The modern lake cargo carriers are over 600 ft. in length and carry about 12,000 tons of cargo. In view of their great economy, the added cost of larger vessels, both to construct and operate, and the greater difficulties of operation, I am not sure that much larger vessels would be built for use on the Great Lakes even were greater drafts available. It is quite probable that had greater depths been available originally, a somewhat different type of vessel would have been developed; that is, the vessel probably would have been of greater depth and lesser beam, but possibly no larger. The conditions have existed so long, however, that I would repeat that the advantages of greater depths on the Great Lakes would be extremely small.

"If the St. Lawrence should be improved to a depth of 35 ft., conditions would be changed, because then there undoubtedly would be a demand for the improvement of the lake channels and harbors in order that the deep draft ocean ships could reach the lake ports."

It was not General Taylor's understanding when he wrote the letter that the inquiry dealt in any way with the St. Lawrence improvement. He authorized this statement setting forth his position in the matter of the improvement of the St. Lawrence:

"Beyond any question, the St. Lawrence, sooner or later, will be developed for power and navigation purposes. The demand for the river's power resources eventually will become so insistent that it cannot be resisted.

"When the river is developed for power purposes, the added cost of the navigation project would be such a small additional amount that no one can believe the river will be developed for power purposes only. The two are certain to go hand in hand. On the other hand there could be no thought of carrying out the navigation project without the development of the stream's power resources.

"To determine the exact time when these developments should go forward depends on an economic survey. Until data of that kind are made available, I would not care to express an opinion as to when the development of the St. Lawrence should begin."

Personnel on the Conneaut Viaduct

In the article in *Engineering News-Record*, June 19, 1924, p. 1047, entitled "Construction Methods and Plant for the Conneaut Viaduct," the statement at the end regarding the personnel is not fully descriptive of the responsible engineers and contractors on the work. The following correction is, therefore, made: The Conneaut viaduct was designed by Wendell P. Brown, Cleveland, Ohio, consulting engineer for Ashtabula County, under the administration of A. G. Bixler, county engineer, and D. W. Leggett, bridge engineer. The contractor was the Pitt Construction Co., Pittsburgh, Pa., and the field engineering and inspection were done by J. R. Burkey, state highway bridge engineer, and two assistants. Federal aid toward cost of construction was administered through the State Highway Department, who awarded the contract and supervised the construction. The work was started under the administration of L. C. Herrick, director of highways, who has since been succeeded by L. A. Boulay. The steel centers which were used for the concrete arches were designed and built by the Blaw-Knox Co. of Pittsburgh.

Mechanical Adjustment of Grade for Gravity Switching

Table at Top of Hump in Detroit Yard Is Raised and Lowered by Jacks to Vary Starting Grade from 1 to 3 per Cent

A "MECHANICAL HUMP" for varying the grade at the summit of the incline for gravity switching is a novel feature of the Ecorse freight yard at the new Detroit terminals of the Pennsylvania-Detroit R.R., described in the Aug. 7 issue, P. 227. The mechanism for raising and lowering the table which forms the summit of the hump is shown in Fig. 1. The purpose of this device is to adjust the starting grade according to weather conditions in order to give the cars a uniform speed over the scale, thus permitting each car to have the proper velocity for weighing as it traverses the scale track. Under the rules of the Interstate Commerce Commission the speed of cars over the scale must not exceed 4 m.p.h. and each car must be entirely alone upon the scale for a minimum of three seconds.

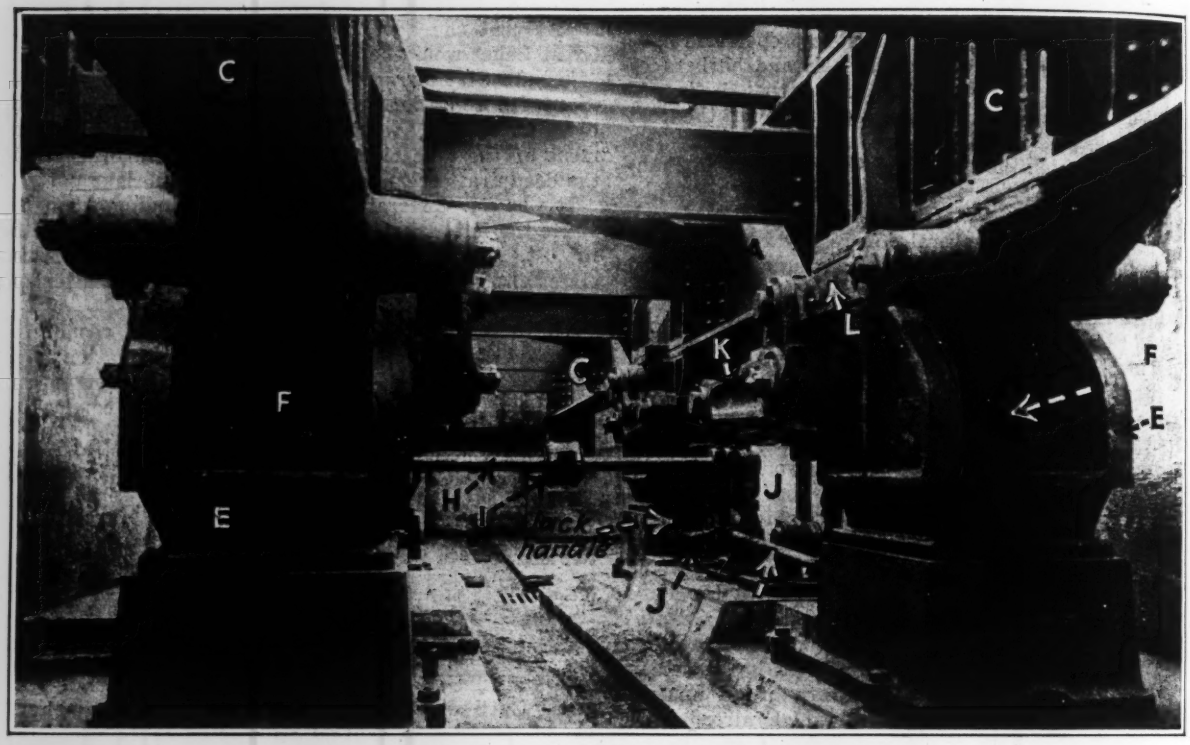


FIG. 1—ADJUSTING MECHANISM OF "MECHANICAL HUMP"

With the ordinary construction, in which the track at the apex is simply laid on the fill forming the hump, the grade from the apex or summit of the hump to the scale is fixed, except as it may become distorted more or less under traffic by settling of roadbed or shifting of ballast. In some cases where changes of climate are severe, the track is adjusted by the yard gang to give a steeper grade for winter and a flatter grade for summer. The mechanical hump avoids the distortion of normal grade and eliminates the work of surfacing track to give the desired grade, while it provides for ready adjustment of grade to suit varying climatic or other conditions.

It will be understood that the required starting grade from the apex of the hump, and consequently the elevation of the apex, will vary with seasonal changes. In the winter, when cars run less easily and the journal-box lubrication is stiff, the grade needs to be relatively steep to give the proper velocity. In summer, with free lubrication and the cars running easily, a flatter grade is necessary to prevent excessive speed over the scale. Furthermore, loaded cars usually run more freely than empty cars.

There are differences also in the cars themselves, particularly as to length of total wheelbase, which affect somewhat the time occupied in traversing the scale. With the mechanical hump, however, this variation in wheelbase is in part compensated automatically. When the grade to the scale is short, as is desirable, the increased velocity required in running down that grade varies inversely with the wheelbase of the car, so that a car of long wheelbase will move somewhat more slowly across the scale than one with a short wheelbase.

In the arrangement at Detroit, the approach or ascending grade from the receiving yard ends at the mechanical hump, the table of which is 45 ft. long and is normally on a descending grade of 1 per cent. Immediately adjoining this table is the 62-ft. scale platform, which is on a grade of 0.8 per cent. Beyond the scale is a descending grade of 0.8 per cent for 200 ft., followed by 100 ft. of 3 per cent and then 1 per cent into the classification yard. The first switch of this yard is about 250 ft. beyond the scale. By the mechanical hump the first or starting grade may be made from 1 per cent to 3 per cent, with a length of about 21 ft. For rapid and accurate weighing it is desirable to have the scale platform and the starting grade from the apex of the hump as short as possible, and it has been general practice to make the length of this starting grade about equal to the distance between

centers of trucks of cars of the shortest wheelbase. At Detroit, this length is 21 ft.

In the mechanical hump as originally designed and built the table was in two sections, as shown in Fig. 2. The outer ends rested on pin bearings or shoe pins and the adjacent ends rested on a saddle casting which could be raised or lowered by hand-operated toggle lever jacks. This arrangement gives a short ascending grade on the approach side to bunch the cars together and thus relieve the couplers for uncoupling, while on the other side there is a somewhat steeper grade to the scale. Some practical difficulties were experienced in the first installation, however, because the acceleration of the front end of the car on the down grade was offset to some extent by the resistance to the upward movement of the rear truck while still on the ascending grade of the approach to the hump.

To eliminate this difficulty, the Detroit table is made in three sections, as shown in Fig. 3. The middle section, *A*, is 9 ft. long and is level at any position, moving vertically between fixed guides, *B*, on the walls of the pit. This 9-ft. section constitutes the apex of the hump. The two end sections of the table, *C* and *C*, pivot on end pins, *D*, *D*, and have bronze friction plates with fixed guideways to limit lateral movement. The pivoted section on the ascending side of the hump is 15 ft. long, while the section on the descending side, adjacent to the track scale is 21 ft. long. Each of the four main shoes or saddle castings, *E*, supports the table *A* directly and also contains the end shoe bearing *F* of table *C*. Fig. 4 shows cross-sections through the hump table and its operating mechanism.

In operation, the castings *E* are raised by four 15-ton ball-bearing screw jacks, *G*, the table section, *A*, moving vertically while the side sections, *C*, *C*, swing on their end bearings. When thus raised, steel shims or liners ½ in. and 1 in. thick are inserted under the castings, *E*, to the required thickness. The jacks then lower the castings upon the liners and are released. To lower the table and reduce the grade, the jacks raise the castings sufficiently to permit the liners to be removed; they then lower the castings and seat them upon their pedestals. The lift of the table is from a minimum of 1½ in. to a maximum of 5 in., giving grades of 0.8 and 2.8 per cent, respectively, on the upper side, and 0.6 and 3 per cent, respectively, on the side adjacent to the track scale.

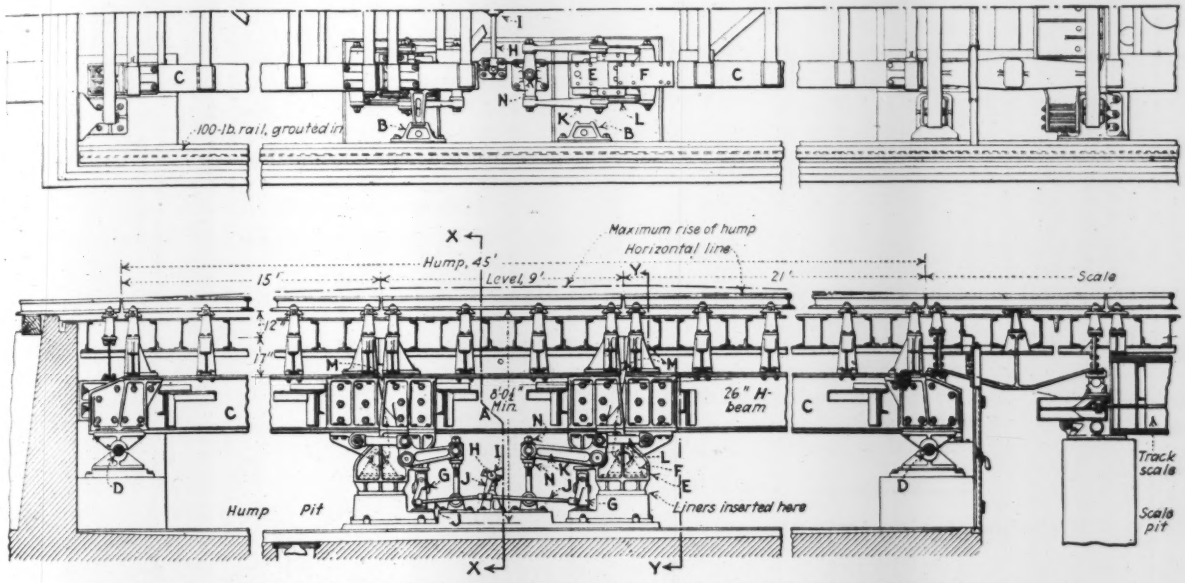


FIG. 3—"MECHANICAL HUMP" FOR GRAVITY SWITCHING; PENNSYLVANIA-DETROIT R.R.

This raising and lowering of the hump is effected by manual operation in the pit. A cross shaft, *H*, operated by bars in a capstan head, *I*, is connected to the lever handles of the four jacks by links, *J*, *J*. A lever system, *K*, *L*, regulates the width of opening *M* due to the radial movement of the pivoted table sections *C*, *C*. Ordinarily this regulation is automatic, but if the clearance openings are not equal when the hump is raised to its maximum elevation, they can be adjusted by means of the nuts *N* at the end of lever *K*. A change of elevation can be made in about fifteen minutes, and under certain conditions during severe winter months it has been found advantageous to raise the hump for night work and to lower it for work in the day-time.

A concrete pit, forming an extension of the scale pit, houses the hump table and its mechanism, as shown in Figs. 1 and 3. In Fig. 1 is plainly shown the lever system to equalize the openings between the table section and hump rails; also the horizontal shaft and capstan head for operating simultaneously the four

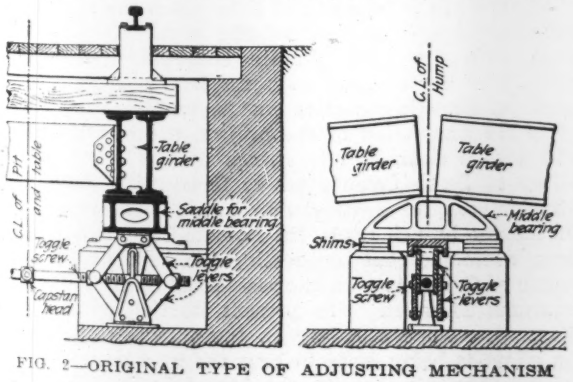


FIG. 2—ORIGINAL TYPE OF ADJUSTING MECHANISM

screw jacks. Each section of the table consists of a pair of 26-in. girder or H-beams supporting cast-iron crossties provided with pedestals for the attachment of the track rails. The deck plating at this portion of

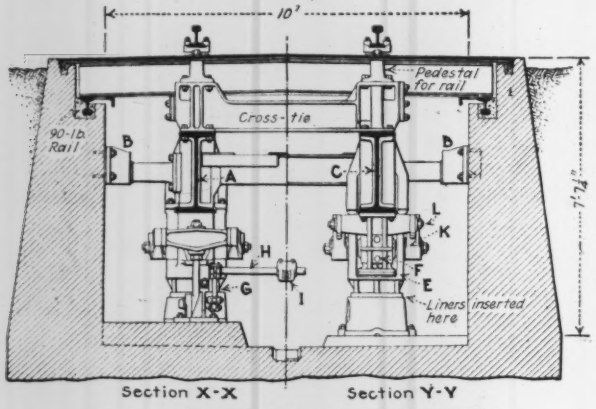


FIG. 4—HUMP TABLE AND MECHANISM

the table is supported by transverse 12-in. channels, and this deck is covered with asphalt mastic pavement.

A mechanical hump of this type was first installed at West Brownsville Junction, on the Monongahela Division of the Pennsylvania R.R. That was of the type shown in Fig. 2 and has been in service for about fourteen years. The Detroit installation, made in 1923, is the fifth, and is of the improved type, as described above. It was designed and built by the Pennsylvania Railroad.

Reforestation in Indiana

AN ENDEAVOR to reclaim barren lands which have proved useless after being cleared for agricultural purposes, is being made by the Indiana State Conservation Commission, as described by W. A. Guthrie, chairman, in the "Bulletin" of the National Association of Railroad Tie Producers. An abstract follows:

Practically the whole of Indiana formerly was covered with vast hardwood forests, but the wanton expenditure of our timber was such that we have less than 1,600,000 acres or about 7 per cent of the land area producing timber. Of virgin forest, only a few traces remain. With more than two million acres now producing only weeds and briars, and purchasable in several counties along the Ohio watershed for $5 to $8 an acre, it manifestly is the duty of the state to buy this land and put it to work growing the badly needed timber. These lands, which produced the finest hardwoods, were cleared many years ago, but futile attempts to make them profitable through agriculture and dairying were soon abandoned.

Efforts are now being made by the State Conservation Department to ascertain the forest conditions in order that a campaign may be carried on for promptly replenishing our vanishing timber supply. A step toward encouraging private forestry was taken a few years ago when a law was enacted permitting a land owner to classify forest land and then be assessed on this for taxation at the basis of $1 an acre. About 8,000 acres of land are classified under this act.

Indiana made its first beginning at reforestation in 1903 by purchasing for $16,000 about 2,000 acres in Clark County. On this tract is conducted one of the largest experiments in growing hardwoods ever exploited in the United States. Annually seedlings and small trees are sold to citizens at cost of production. On this tract it is determined which species do best in certain soils, under certain conditions as regards topography, and how plantings should be spaced.

Automobile Toll Road from Milan to Italian Lakes

New Highway Has No Grade Crossings—Heavy Earthwork Gives Easy Grades and Curves —Pavement Slab Has Tar Mat

This description is compiled from data and photographs furnished by Prof. F. A. Shepley, Staff Correspondent, American Trade Press, New York City.—EDITOR.

CONSTRUCTION of a concrete toll road exclusively for motor vehicles is in progress from Milan, Italy, to Sesto Calende on Lake Maggiore. With two branches north, one to Como and one to Varese, the total length of road will be 55 miles. Besides its construction with private capital and its operation as a toll road this highway offers several features of interest. The location is new, existing roads are not followed; grade and curvature are kept down and towns are skirted and not passed through. All crossing routes are passed over or under. Only motor vehicle traffic is permitted and a parallel path separates motorcycle traffic from main

FIG. 1—AUTOMOBILE TOLL ROAD FROM MILAN TO ITALIAN LAKES

road traffic. There will be strict traffic control. Virtually the road is a motor vehicle speedway.

Surveys were made in 1921 by Piero Puricelli, civil engineer, Milan, who has been a prime mover in the enterprise. The project was approved by the Italian government in December and Prime Minister Mussolini appointed a special commissioner with full power to treat with the 1,500 private landowners and local authorities for right-of-way, for land purchase, concessions, etc. Construction was begun March 26, 1923.

On the completion of the project, the new highway will give a clear 30-mile stretch of speedway linking Milan to Sesto Calende where it will join onto the Simplon road for Switzerland. Fig. 1 is a sketch map. Of the two branch roads, the Lainate-Como is 14 miles long, while the route connecting the important cotton center of Gallarate with the residential town of Varese, measures 11 miles. The present starting point is at Musocco, a huge cemetery on the outskirts of Milan. An effort is being made to have the inlet brought to a point well within the city, the Arco della Pace (erected

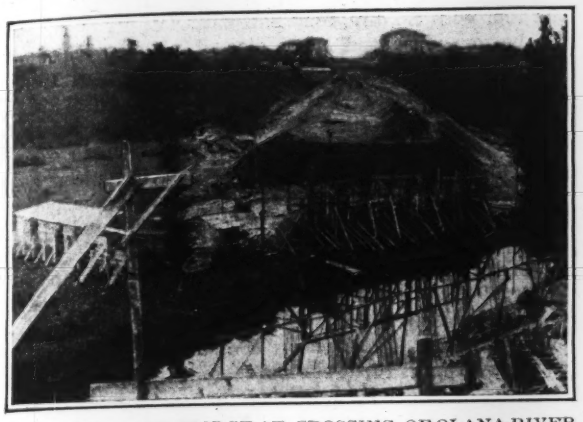


FIG. 2—FILL AND BRIDGE AT CROSSING OF OLANA RIVER

by Napoleon, 1807). With this, an imposing entrance would be assured. From Como the road will be extended to Chiasso on the Swiss frontier, thus becoming an integral part of the great international road.

The width of the main road is 46 ft., the actual carriageway measuring 33 ft. and 13 ft. being left for shoulders. The two branches are 36 ft. wide with 27 ft. allowed for carriageway. Wherever level crossings, public highways, rivers and canals are met, they are bridged. Altogether there will be 1,000,000 sq.ft. of paving requiring 55,000 metric tons of cement, 157,000 cu.yd. of broken stone, and 81,000 cu.yd. of sand. The stone is quarried at Bisuchio where four crushers prepare 700 cu.yd. daily. Curves have been reduced to a minimum, most of them having a radial measurement of 3,285 yd. Others are of 2,185, 1,640, 1,100 and the three most reduced have a radius of 435 yd. In no instance do gradients exceed 3 in 100 and this only for short distances.

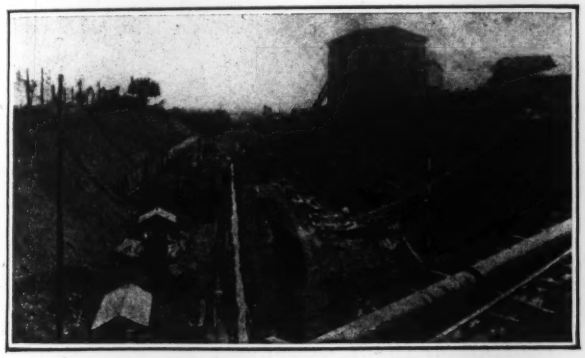


FIG. 3—APPROACH CUT THROUGH RIDGE AT OLANA RIVER BRIDGE

The estimated cost of the undertaking is approximately $2,600,000, allowing $47,300 per mile. The capital of the Autostrade Co., Ltd., is $1,090,000. For a period of 50 years, the government guarantees, but does not contribute, roughly $40,000 annually. The Italian Touring Club and the Milan Automobile Club are also guarantors. In case of need, the company is empowered to raise another $1,000,000 but this is hardly likely to be required.

So far, 2,000,000 cu.yd. of excavation have been moved and 200 structures of reinforced concrete have been constructed. Consideration of the following figures will give a good idea of the magnitude of the work done: 9 railroads, 10 provincial roads and a 490-ft. viaduct have been crossed; 50 rivers and canals have been bridged; countless secondary roads have been passed, either over or under. The views, Figs. 2, 3 and 4, show heavy cuts and fills and concrete bridge construction.

In selecting the paving the engineer of the company made an extended study of American practice. This visit decided the company to use concrete with a covering of tar-compound "as it insures permanency, smoothness, durability, impermeability and perfect load bearing qualities for rubber-tired vehicles. Moreover, it will be practically dustless and self-draining." Incidentally, American paving mixers are being used to place the concrete.

As a basis for computing toll charges and earnings the engineers have compiled from tests made in France and Italy the figures given in the accompanying table.

From case I, we see that there is a saving of $2.22, while in the second case the saving is $1.31. The data obtained on normal roads can be taken as exact while on autostrada the figures are somewhat higher than actual.

Calculating between 50 and 60 per cent of this saving to be levied as toll, there will be a revenue of about $305,000, while advertisement boardings will produce quite $45,000. Upkeep, staff, interest and repayment of loans will account for some $200,000 a year. Consequently there should be a net yearly profit of $150,000. In addition to the foregoing sources of income, it is proposed that $100 tickets available for one year be issued. Then there will be a profit on gasoline, oils and repairs.

FIG. 4—FILL MADE BY END DUMPING WITH INDUSTRIAL RAILWAY

	35 hp. Car for 100 km.		
On normal road		On Autostrada	
26 liters gasoline at 3.20 lire	83.20	18 liters gasoline at 3.20 lire	57.60
Set of tires 895x135 L. 3370 — 6000 km.	56.00	Set of tires L. 3370 11999 km	30.60 51.00
Lire	139.20	Lire	139.20
	10-15 hp. Car for 100 km.		
15 liters gasoline at 3.20 lire	48.00	9 liters gasoline at 3.20 lire	28.80
Set of tires 765 x 105 L. 1600-6000 km	27.00	Set of tires 1600 lire av. 10000 km	16.00
		Net saving	30.20
Lire	75.00	Lire	75.00

There will be a strict traffic control. At convenient distances there will be repair boxes with skilled staffs, first aids, and revictualing stations all in intercommunication by telephone. Distances will be clearly marked and will be illuminated at night.

Aerial Maps Made to Facilitate California Home-Site Survey

Mosaic Superimposed on Plane-Table Topographic Sheet Eases Work of Plotting Roads and Trails in Hills Near Pasadena

BY THEODORE R. MINI
Chief Engineer, the Flintridge Co., Glendale, California

FLINTRIDGE is a tract of land of about 2,000 acres lying between Glendale and Pasadena, California. Part of the tract, some of which is composed of old Spanish grants, is in the San Rafael Hills, where an altitude of 1,900 ft. is attained, though most of it lies in La Canada Valley at an elevation several hundred feet lower. In the general improvement of land for home-building uses in the region, during the last year decision was made to improve most of the tract lying in the hills, that section of it in the valley having previously been laid out in symmetrical blocks and streets.

In the systematic planning for the improvement it was found that no reliable survey or topographic data existed save the quadrangle sheet of the U. S. Geological Survey for the Los Angeles district. This survey was made in 1893-1894 and being on a scale of almost a mile to the inch had little value for the purposes of the proposed improvement. Accordingly it was decided to make an aerial topographic map covering the 500 acres of mountain country.

This tract was first covered with a system of triangulation control points. At each of these points a flag was set on a long pole, with white cloth 3 ft. x 20 ft. placed in the shape of a cross fastened to the ground (with pole and flag in center), for the guidance of the pilot and photographer. When the triangulation stations with the flags and bunting were completed, the actual operation of taking the photographs only consumed about one hour. Flights were made from east to west and vice-versa over the long way of the tract at an altitude of 8,500 ft. and at a speed of 85 m.p.h. A biplane with a 150-hp. Hispano motor was used.

A specially-built camera 34 in. long, 14 in. square at the top, with a 20-in. lens and with a 10-in. opening in the bottom was used. The size of pictures taken was 8x10 in.; the interval between exposures was 15 sec. The photographs taken covered an area 2,975x3,825 ft.

With the air photography completed, a mosaic was made to cover the tract on a scale of 1 in. to 425 ft. Photographs were allowed to overlap 50 per cent, and where necessary rephotography was done; the piecing together of the mosaic was greatly facilitated by employing the triangulation control points.

Before the air survey was made the topographic features of the tract had been carefully mapped in the field. Levels were run, all triangulation control points being tied in. Plane tables completed the map, which was drawn with 10-ft. contours. With this done a negative of the field map was made and with a negative of the mosaic superimposed on the positive topographic sheet an enlargement was made so that the final working scale of 200 ft. to the inch was attained. Titles were put on afterward.

AERIAL-GROUND TOPOGRAPHIC MAP OF FLINTRIDGE TRACT, CALIFORNIA

Agreement between the topographic sheet made by the plane table and the aerial map, superimposed upon the former, is easily seen by tracing the principal road running through the tract.

The superimposing of the topographic map on the aerial map showed remarkable agreement with the aerial map. The result was a complete and accurate aerial topographic map showing roads, trails, houses, firebreaks, brush clearings, hills and ravines, with the contours in addition. With this map it has been possible with ease to plan and locate a systematic though intricate layout of highways.

The roads are being located and built to a width of 30 ft. (a width hitherto little used in building mountain roads), with a maximum gradient of 10 per cent and a minimum curve radius of 100 ft. Building the roads is being accomplished by using two ¾-yd. bucket gasoline-driven continuous-tread shovels. The roads are located so as to use the cut to make the embankment, with occasional end haul with trucks or fresno scrapers. As the roads are located the homesite entrances are planned at the same time and built as the shovel reaches them. Tops of hills are also leveled off for building sites. One of the unique features of this job is that gasoline power drives all equipment. The ploughing, fresno work and grading are all done with small 40-hp. caterpillar tractors.

Some of the roads are being surfaced with two-course macadam with an asphaltic wearing surface, but the majority in the mountainous part have such a firm subgrade of decomposed granite that just a wearing surface of asphalt with pea gravel is placed on it.

The Flintridge tract is owned and being developed by Senator Frank P. Flint. The work is done by the Flintridge Co. forces with Albert Lester as superintendent. The aerial topographic map was made by the Los Angeles Topographic Map Co. with E. D. Monroe as director of engineering. T. R. Mini is chief engineer of the Flintridge Co.

Combating Ice in European Hydro-Electric Plant

Methods Employed in Norway and Sweden—Chief Sources of Trouble—Ice Pressure—Effects of Regulation

Abstract of papers read at the First World Power Conference, London; one on Measures Taken in Sweden Against Ice Troubles at Water Power Plant, by A. Frey Samsioe, Stockholm, Sweden, and one by Arvid Ruths, Norway, on Ice Troubles in Norwegian Water Power Plant.

ICE makes trouble for the hydro-electric plant in three principal ways, the blocking of intakes by frazil ice, the obstruction of gates and penstocks by ice freezing in solid masses, and the damage to intakes at other structures by the pressure of surface ice. Of these three, frazil ice, the long thin crystals of ice carried in running water when at the freezing temperature, presents the most difficulties.

The characteristic feature of undeveloped rivers is their long stretches of rapid water in which the water is cooled quickly and yet where it is too swift to freeze over completely. Even in the more level stretches the stream may not freeze over until mid-winter. These conditions are ideal for the formation of frazil ice. Consequently the greatest trouble from frazil ice occurs in the early winter. The more ice-covered the river becomes, the less subject it is to the cooling effect of the air and the less trouble there will be with frazil ice. The development of the river by the construction of dams and pools, which are comparatively still and freeze over early in the winter, results in a great reduction in the amount of frazil ice, and complete development will eventually result in the entire elimination of the trouble.

The ice needles, as mentioned, are formed in rivers where the current prevents the formation of a continuous sheet of ice, the latter acting as a heat insulating layer against the cooling effect of the air on the water. They are formed when the water temperature sinks from +0.06 deg. to +0.05 deg. C. (32.11 deg. to 32.09 deg. F.) and the formation continues as long as the temperature remains at or below this point. In local whirls these ice needles have a tendency to clot together and these clots will in turn mutually unite, constituting large lumps of ice needles measuring several cubic yards in volume, and float down the river. . . .

The formation of ice needles—as stated—is contingent upon the water temperature being lowered to about 0.06 deg. C. (32.11 deg. F.) and upon the flowing water not being ice covered. Such low water temperature is again dependent upon certain atmospheric conditions, such as air temperature, wind conditions, formation of clouds, etc. By cold north wind and clear weather, frazil ice formation has been observed in the Glommen River at a temperature of a few degrees below celsius zero (32 deg. F.) while no such formation has been observed in cloudy weather under otherwise similar conditions. With air temperatures as low as —25 or —30 deg. C. (—13 or —22 deg. F.) and no wind, frazil ice will not always appear owing to the presence of a heat insulating, moisture saturated layer of air on top of the water, which layer will prevent the cold air from cooling the surface water to the critical temperature. . . . . .

The ice crystals melt and disappear when the water-temperature has risen above the critical temperature, +0.06 deg. C. (32.11 deg. F.), and approaches 0.1 deg. C. (32.18 deg. F.). . . . . .

In the course of time several means have been tried to keep the screens free of frazil ice. To start with, hand scrapers were resorted to for this purpose. As many men as could conveniently find place on the stand above the screens, were mobilized at times of frazil ice formation, trying with scrapers of different lengths to keep the screens free. As a rule, though, these endeavors were entirely in vain; the screens clogged up nevertheless and the output was reduced accordingly. Mechanical scrapers of various designs have also been tried. These were placed in front of the screens, and consisted mainly of a frame structure, to which were fastened suitably spaced horizontal beams provided with teeth meshing with the openings between the screen bars. The frame, driven by a motor, was arranged to slide up and down the screen, and by this motion of the teeth between the bars the screens were to be kept free of frazil ice. But also these mechanical scrapers have proved unsuccessful, the ice formation being occasionally so heavy that they stopped entirely.

It develops that the screens must be removed when the ice troubles start and be replaced by a coarse rack of wooden planks. This arrangement allows the frazil ice to pass through the turbines as comparatively loose masses, from which no damage will result. But smaller or larger pieces of solid ice following the current and passing through the racks may involve a certain danger to the turbines. Of course, such racks can also be clogged up with ice, and their use is therefore rather delusive.

Proper depth location of the screens must embody complete submersion during winter time. The temperature of the screen bar will then be the same as that of the water, also when the temperature of the latter falls below the critical point. Consequently, when frazil ice formation commences, the bars will possess the same low temperature and the ice needles will stick to the bars.

If, by any means, the temperature of the bars could successfully be raised above the critical, to a temperature between +0.06 deg. and +0.1 deg. C. (32.11 deg. and 32.18 deg. F.), the ice needles would no longer adhere to the bars and the worst troubles from frazil ice would be overcome.

Heating the bars by steam has been tried. The bars were then made hollow, with pipes conveying steam inserted into them. This method, however, has not proved satisfactory; it is elaborate, the bars must be thicker than usual, entailing a loss in net area of the screens; the steam pipes become leaky, whereby the heating of the bars ceases and the freezing-up commences. This steam heating is also very uneconomical as far as the thermal efficiency is concerned, and can be considered only for plants producing steam for other purposes also.

At the Borregaard power plant on the Glommen some screens are heated in this way and the steam consumption amounts to 13 kg. (29 lb.) of steam per hour per square meter (10.8 sq.ft.) net screen area (minimum water area).

The best remedy hitherto devised for protection of the screens against frazil ice is electrical heating of the bars. By this method, either single bars, or groups of bars, are connected in series. The current then passes through all the series connected bars, or groups of bars, and heats them.

For common screens with a water velocity from 0.4 to 0.7 m. per sec. (1.3 to 2.3 ft. per sec.) and a bar section of about 400 to 700 mm.² (0.6 to 1.0 sq.in.), sufficient heating of the bars will be obtained with 250 to 300 amperes per bar, a.c. 50 cycles.

Trouble from frazil ice and drift ice can largely be overcome if the surface of the forebay and canal can be made to freeze over. To this end wooden ribworks or logs, floating upon the surface of the water, are arranged in the stream. Thereby the surface velocity is decreased, ice floes will form, and soon a sheet of ice will cover the stream from shore to shore. Where this is not possible and where the entire flow of the river passes through the canal, all drift ice, frazil ice, as well

as solid ice, will be carried directly to the screens. In such cases an ice-sluice is provided which, when open, will create a surface current alongside the screens by means of which the solid drift ice is removed with comparative ease.

But only surface ice can be removed in this way; drifting frazil ice floats at any depth, sometimes filling the whole channel, and gathers into large lumps which are forced against the screens partly closing them or entirely closing them and subjecting them to heavy strains due to the unequal water pressure.

Ice sluices and various other discharge openings are liable to clog up with ice, and must be kept open by steadily cutting the ice away. Such icing is prevented by inserting electrical heating elements in the adjacent masonry, such elements to be of about 1,000 watts capacity, spaced about 1½ to 2 meters (5 to 6½ ft.) apart. In this way the masonry is heated sufficiently to exclude the possibility of ice growth, facilitating clean discharge passages during the most severe frosts.

The same preventive, i.e., embedded heat elements, can also be used as a guard against roller dams freezing up to the side walls at both ends of the roller. Equal results are also obtained by provision of suitably located, electrically heated steel bars.

Another source of trouble from such severe frost periods is that large quantities of water are quickly converted into surface ice, ice needles, and anchor ice, as a result of which the flow will diminish appreciably. The amount of course varies on different rivers—on the Glommen, with a regulated flow of 7,770 sec.-ft., it has amounted to as much as 13 per cent, and on the Numedalslaagen, with a regulated flow of 1,236 sec.-ft., to 25 per cent. On regulated streams, where the power plant is close to the storage reservoir, this condition is of little importance, but where the reservoir is far removed it may cause a serious diminution in the output of the plant.

Ice Pressure—Another difficulty is due to the pressure of the ice against the dams. This pressure is generally explained as follows: During periods of intense cold, the surface of the ice gradually assumes the temperature of the air, which results in tensile stresses and cracks. Some of these cracks get filled with water which soon freezes. Later, when a mild day comes, the temperature of the ice is raised to about 0 deg. C. (32 deg. F.), which results in a pressure in the ice. If the ice abuts on a dam, this dam will suffer under the pressure. The magnitude of this pressure has, no doubt, in many cases been much over-rated. As a matter of fact the ice acts very much as a viscoidal fluid slowly yielding under pressure. As considerable changes in the temperature of the air do not occur instantly, and as, in any case, it takes some time before any great change of the temperature of the ice ensues, especially when the ice is covered with snow, the ice will gradually yield and the resulting maximum pressure will be much less than has been calculated for in several extreme cases.

Pressure from an ice field will not exceed 30 tons per linear meter (9 tons per linear ft.) when the ice is 1 m. (40 in.) thick, and 20 tons per linear meter (6 tons per liner ft.) when the ice is 0.75 m. (30 in.) thick.

Ice fields of such thickness naturally do not appear in Sweden except in the northernmost parts of the country. In the south of Sweden the maximum thickness of the ice fields is about 0.5 m. (20 in.). As the ice pressure is nevertheless inconvenient, many means have been invented to decrease or eliminate it. It has been proposed to give the dams a sloping upstream face so that the ice should slide up along the incline, or to introduce some plastic material between the facing and the supporting structure, thus allowing a certain yielding. It has further been proposed to resort to the method of blowing compressed air into the water in front of the dam as applied at the Keokuk dam in the Mississippi River, or to melt away the ice by means of electric radiators ranged along the dam. Generally the dam owners content themselves with cutting slots in the ice in front of their dams, and with covering these slots with spruce brush and snow, or straw and manure, and, as a matter of fact, there have been very few instances in Sweden of the ice pressure causing any damage.

N. Y. Building Bureau Reports on Three Derrick Failures

Inspectors' Findings Concerning Collapses of June 25, July 28 and 31 Show One Only Due to Faulty Equipment

WITHIN a month three derricks, two with wooden masts and booms, the third of steel, failed in New York City, each precipitating its load of steel to the street below. The first accident occurred at 36th St. and 7th Ave. on June 25, the second accident at 262 West 35th St. on July 28, and the third at 137 West 30th St. on July 31. Miraculously enough but two people were killed in all of the three accidents though several were injured. Those two deaths occurred at the West 30th St. job and the men killed were employees of Levering & Garrigues, the steel erectors. Perusal of the reports of assistant engineers and inspectors from the Manhattan Bureau of Buildings indicates that two of the accidents were due to operation and one to faulty equipment. In the instances where the accidents were due to operation of the derricks, no action was taken by the building department. In the case of the accident on 35th St. where a faulty boom was discovered, the report of the inspector was turned over to the district attorney of New York County.

L. M. Bernfeld, assistant engineer in the Bureau of Buildings, who examined the premises at 260-262 West 35th St., came across a fragment of the boom which was lodged on the third story. The piece was about 8 ft. long and had a crack across the face about 7 ft. long. Writing a few hours after the accident, Mr. Bernfeld said:

I inspected the steel in place at each story and found a considerable number of beams and lintels in place, which were distorted by the boom in its fall. During the inspection I came across a fragment of the boom, which was lodged in the third story, and which I ordered preserved by Superintendent Lyle. This piece was about 8 ft. long, and painted with asphalt on one face for an area about 7 ft. long and 8 in. deep and covered with oakum of varying thicknesses, up to ½ in. This shows that the boom had a shrinkage crack about 7 ft. long and 8 in. deep and that this crack was filled in with asphalt and oakum. As the boom was 12 in. in diameter, this crack would have been sufficient to cause the accident at any time.

I arrived at above location at 2:18 p.m. This building, under construction, is a 14-story manufacturing building. The iron contractor is the Hedden Construction Co. and the superintendent for the general contractor is L. V. Lyle. The general contractor is S. S. Roth.

The structure is up to the tenth story, where the derrick rests, with parts of the eleventh and twelfth stories being set. There are floor wood centers in the first six stories, with the seventh and eighth tiers open, and the ninth and tenth tiers planked over. Due to strike conditions masons and concrete floor arch men were not at work. Riveting was being done on the seventh and eighth tiers.

Conclusion—The accident was due to defective equipment, the defect being of such a nature that it could not be reasonably expected to have been discovered by the inspector of this Bureau. The man who cleaned out a crack 8 in. deep and painted it with asphalt and packed it with ½ in. of oakum, was irresponsible or incompetent. He

should have provided an iron ring around the crack, or he should have bolted through it, or else discarded the boom altogether as being defective.

West Thirtieth St. Failure—At the West 30th St. site where Levering & Garrigues are the steel erectors, the load got away from the operators and before the speed which the boom had acquired could be overcome, it had hit a guy line throwing undue strain into the mast. The report of the inspector is to the effect that this undue strain caused the foot block to kick out and the derrick to collapse. The general superintendent of Levering & Garrigues reported to his firm that he believed this strain to have exerted a purely vertical pressure on the foot block with the result that the I-beams upon which the derrick rested in the inside bay gave way and the derrick started to fall vertically. However, the boom crashed over the outside girder and kept the derrick from falling far. The mast is in perfect condition though the boom was bent and twisted. James J. Stack, assistant engineer in the Bureau of Buildings, reported the accident as follows:

At the time of the accident two of the men killed were part of a force operating a steel derrick located on the sixth tier of beams, to which elevation the steel of the 12-story skeleton construction building was erected.

An approximate load of 7 tons of steel was being hoisted from the 31st St. side near the northwest corner of the building and had almost reached the fourth tier when the support under footblocks of 80-ft. mast gave way and fell to floors below, carrying the two men with it. One man fell to second floor and one to first floor.

The hoist engine for the derrick was at first tier underneath derrick on sixth tier. The two men killed were working on the arm at foot of mast which was rotated by hand power.

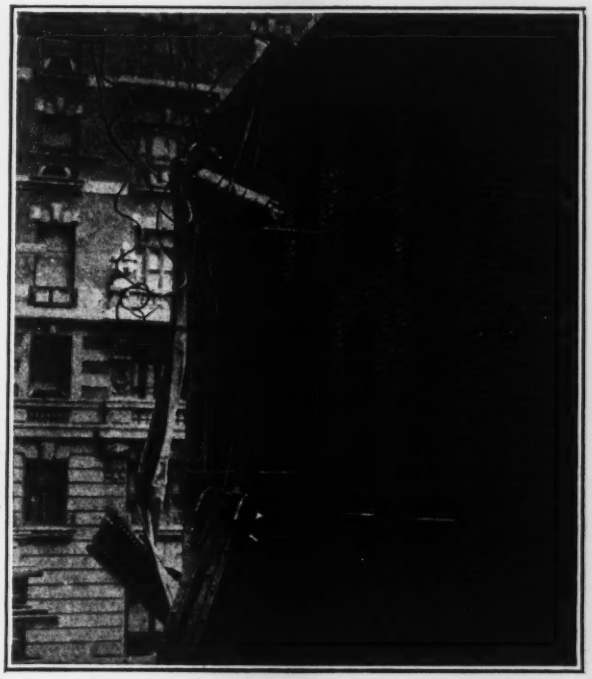
From information received on premises the load of steel

MAST TOP WITH ANCHOR CABLES: WEST 36TH ST. FAILURE

swung and hit the steel guy rope near the northwest corner of building and the supports of footblock which consisted of four 12 x 12-in. timbers supported on permanent steel failed. Two of the 10-in. I-s which were supported by 20-in. I-beams fell to first floor due to shearing of the bolts at the connections, and were twisted and buckled. One of the two beams of the four 10-in. I-beams supporting the footblocks remaining in place was bent and buckled.

Apparently the force caused by the load hitting the guy rope caused the mast to kick at the footblocks and the bolts of the two 10-in. I-beams sheared, causing the derrick to fall.

The load fell partly to vacant yard and across sidewalk on west and the boom broke when it hit steel of sixth tier. The boom was 70 ft. long.



STEEL FELL THROUGH FIVE STORIES OF THIS HOTEL

Accident of June 25—The first accident, that of June 25 at 36th St. and 7th Ave., is similar to the one on 30th St. in that the men lost control of the load as it was being hoisted, which allowed the boom to swing, striking a guy cable. Instead of the footblocking or derrick supports giving way the wooden derrick mast snapped about 4 ft. below its top. The load of steel was precipitated through the roof and to the first floor of a five-story masonry hotel. Eleven people received minor injuries in that accident though no one was killed. Frederick C. Kuehnle, chief inspector of the bureau, reports this accident as follows:

I found that at the new building in course of erection at 202-204 West 36th St., where the steel had been set to the sixth story level, a derrick had been set on the sixth floor, consisting of a wooden mast about 50 ft. high and a wood boom about 40 ft. long, and was being used for the purpose of hoisting steel.

It appears that a load of steel beams, the weight of which was estimated at about 4 tons, was being hoisted in front of these premises, and after reaching the height above the roof of the adjoining building to the east, which is the southwest corner of 36th St. and Seventh Ave., the men lost control of the load that was being hoisted, which allowed the boom to swing to the southeast, striking the northeast guy cable, and snapping the mast of the derrick, precipitating the load of the steel and boom to the first story of the corner building. Eleven people were reported to have received injuries. No one was killed in the accident.

This building was being erected under New Building Application 571/23. Charles B. Meyers, architect. Owners, Kaufwein Realty Co., 700 Seventh Ave. Steel erectors, Paterson Bridge Co., 501 Straight St., Paterson, N. J., who were working under permit No. 1890. Foreman in charge for the Paterson Bridge Co. was Alfred Feldt, 515 48th St., Brooklyn, N. Y.

Lloyd Dam and Lloyd Barrage in India, Confused

In our issue of May 22, 1924, p. 904, appeared an article entitled "India Building World's Greatest Irrigation Project." This article was based on two separate contributions which appeared to describe the same project. It now appears that two separate projects were described, the Lloyd Dam near Poona in the Deccan and the Lloyd Barrage at Sukkur in Sind. The illustrations shown were of the Lloyd Dam, not of the Lloyd Barrage at Sukkur as indicated.

We regret that such a mistake should have occurred, particularly in reference to such great undertakings in India because of the time which necessarily elapsed before this correction could be made. The following description is from the Triennial Review of Irrigation in India, 1918-1921, supplemented by information as to present status received from the Public Water Department, Government of Bombay.—EDITOR.

Lloyd Dam at Bhatghar

THE LLOYD or Bhatghar Dam is 35 miles from Poona in the Bombay Deccan. It is on the Yelwandi River, a tributary of the Nira River, and is for the purpose of increasing the storage of Lake Whiting, an artificial reservoir formed by the original dam at Bhatghar. The project includes the construction of a new canal on the right bank of the Nira River, below Bhatghar, at Vir, to supplement the existing one on the left bank.

The original intention was to raise the existing dam on Lake Whiting at Bhatghar, but later it was decided to build a new dam a little lower down the river. The storage obtained in the reservoir thus formed will be 24,300 million cu.ft., being the largest yet constructed in British India, while the dam when completed will rank among the greatest in the world, the structure comprising 21½ million cu.ft. of masonry. This is, it is believed, greater than the masonry content of any yet built except the Aswan (Assuan) Dam in Egypt. The maximum height of the existing Lake Whiting dam is 127 ft.; the new dam will be 60 ft. higher and have a length of 5,333 ft. Two waste weirs with 81 openings, 10 ft. 3 in. each, of which 45 are fitted with automatic and 36 with roller gates, are to be built into the body of the dam. The Right Bank Canal, which is 109 miles long, commands an area of 560,000 acres, of which 132,000 are to be irrigated annually.

Work on the dam has been under way for some time and it is now nearing completion.

Lloyd Barrage at Sukkur

THE LLOYD or Sukkur Barrage is located at Sukkur in Sind. It consists of a low weir with crest gates built across the Indus River. It is to furnish an assured supply to the country now irrigated by inundation canals through the construction of a barrage across the Indus below Sukkur where the river passes through a deep gorge. The site chosen is some three miles downstream from the gorge and from this point seven canals, four on the left bank and three on the right, will run southward taking up the irrigation at present effected from the existing inundation canals and extending facilities for cultivation to an enormous area at present waste. The barrage will consist of a masonry floor across the river, at a level somewhat lower than the average level of the river bed, above which an over-bridge of 66 spans, each 60 ft. wide, will be constructed. From this over-bridge, shutters 60 ft. long and 18½ ft. high can be lowered on the floor when the river falls, thus ponding up water to the level required in the canal.

The barrage, when completed, will measure 4,725 ft. between faces of the regulators on either side. These regulators are seven in number. On the left bank two small canals will take off which will irrigate Khairpur State, the existing inundation irrigation in which would otherwise be adversely affected by the barrage, and two great channels will also have their heads on that bank, one, the Rohri Canal, to take up and convert into perennial the inundation irrigation now effected between the barrage site and Hyderabad, and to extend perennial irrigation to new tracts, the other to feed the Eastern Nara Channel and the existing canals which derive their supply from it.

The regulators will consist of a series of arched openings, each 25-ft. span, fitted with lifting gates; the two Khairpur Canals have each two such openings, the Rohri Canal ten, and the Eastern Nara Feeder twelve. The Rohri Canal is designed for 10,992 sec.-ft. and the Eastern Nara for 12,200 sec.-ft.

The three canals on the right bank comprise two perennial and one purely rice canal; they will take up existing inundation irrigation below Sukkur and permit extensions to land now waste. The regulators at the head have been given respectively four and five spans of 25 ft. in the case of the southeastern and northwestern perennial canals, while the Central Rice Canal has ten such spans. The Right Bank Canals will carry 19,446 sec.-ft. during the monsoon and 6,281 sec-ft. during the rest of the year when the Rice Canal is closed. The supply required by the whole system of canals varies throughout the year from 22,656 sec-ft. in January and February to 45,926 sec.-ft. from June to September.

A gross area of 7½ million acres is commanded, of which 6½ million is culturable, and an annual irrigation of 5¼ million acres is anticipated, of which 2,000,000 represent existing inundation irrigation given an assured supply.

Work on this project has just been started. Both projects are under construction by the Public Works Department Engineers of the Bombay Presidency.

British Experience With Rubber Paving

London Correspondence

Some months ago the Cenotaph (memorial to British dead in the war) was surrounded on all sides by rubber paving with the view of deadening the sound of traffic while passing it. The diminution of sound was, incidentally, quite unnoticeable, because the noise of motor traffic is not due to the wheels on the road but to the engines. After a few weeks it was noticed that the rubber blocks were creeping, and it was soon obvious that the rubber blocks would not prove satisfactory under present conditions of laying and grouting. The blocks are to be taken up and the area to be relaid with 5-in. pine blocks to correspond with the surrounding road. Expert opinion is that the experience gained assures success to rubber paving for lighter traffic.

Highway Requirements Indicated By Traffic Growth

California Traffic Increases 20 to 25 Per Cent Yearly—A Plea for Motorways Free From Interruption

A TRAFFIC increase on the California state highway system of 47.4 per cent in two years was shown by counts made in 1920 and 1922, and during the same period automobile registration increased 54 per cent. Last year's registration of 1,100,000 vehicles represents an increase of 28 per cent over the figure for 1922, and it is believed that the traffic increase has been in approximately the same ratio. The problem of providing adequate highways for such rapidly increasing traffic was discussed by A. E. Loder, manager, Road Bureau, California State Automobile Association, at the June meeting of the American Society of Civil Engineers in Pasadena. The following has been extracted from Mr. Loder's paper which was a discussion of a paper by Dr. L. I. Hewes, deputy chief engineer, Bureau of Public Roads, who presented an exhaustive review of traffic counts and statistics on California highways.

Problems—California ownership of automobiles shows the high figure of one for every 3.8 persons. One of the chief difficulties in providing suitable highways is due to the concentration of traffic or peak loads that occur on Sundays and holidays, particularly in the vicinity of large cities. City motorists prefer to do their holiday driving in the country, but already conditions are such that a large percentage of city motorists must remain at home on holidays because of the limited capacity of the highways. If the traffic exceeds the capacity of the highways to such an extent that only slow speed can be made and traffic jams occur frequently, it may be that the highway service can be rated at only about 10 per cent efficiency. In future designing, highway efficiency must be given more consideration.

Future inter-city highways should be so located and built as to make possible continuous speed of 40 miles an hour or more under operating conditions such that vehicles can follow each other more closely than would be safe on present highways with their frequent intersections and interruptions. New legislation is needed to facilitate the construction of great highways between large centers of population, whereby complete ownership and control of the roadway will be vested in the state. The present-day highway is little more than an easement over property whose owners exercise the right of creating as many dangerous intersections and frontage obstructions as they choose. No sooner is an important inter-city highway paved to an ample width than stores and other places of business spring up along it, followed by an unlimited number of intersections and an extensive parking of vehicles. Particularly unfortunate is the frequent location of large school buildings directly upon main traffic thoroughfares, where the school children are subjected to the greatest traffic danger and the traffic, in turn, is subjected to serious and unnecessary delay. This only serves to emphasize the need for high-speed motorways fenced or walled on either side and, with the exception of emergency exits, crossing intersections at five or ten mile intervals only. Such motorways could perform the increasingly important function of providing the greatest possible number of people with the most efficient highway service. Such motorways should be kept free from local interruptions, even though it became necessary to build on both sides of the motorway continuous local roads to which the abutting property would have free access, as at present.

There is only a remote possibility of reaching the so-called "saturation point" in ownership of motor vehicles. Obviously there will be occasional slackening or acceleration in the ownership of vehicles and in road construction programs, just as there are periods of financial depression or expansion, but unquestionably the use of motor vehicles is destined to increase and with it the need for more highways and greater highway efficiency. The present indications are that by 1930 California may expect a registration of three and one-half million motor vehicles, corresponding to a total traffic volume four times as great as that measured in 1922.

To this may be added a material increase in traffic caused by motor guests in the state. In 1922 some 28,000 cars from other states toured in California and in 1923 more than 66,000 cars, or an increase of 135 per cent in one year. If this condition exists when the inter-state connections are still unimproved, what may be expected in the next few years when a number of transcontinental highways have been improved to such an extent as to make the trip a pleasure instead of an adventure?

California now faces the question of how to provide means of raising something like $200,000,000 for the completion of work which seems desirable on the state highway system to provide for present traffic conditions. It is probable that, even though this work were completed within the next eight or ten years, the state would then find itself facing an even larger financial problem to care for the volume of traffic that would have developed by that time.

Not only in California, but wherever motor traffic is rapidly increasing, highway officials must look well into the future in laying out highway systems. It is significant that there is a growing need and demand for special highway service on main thoroughfares between cities used chiefly by through cars. This demand for special motorways will doubtless increase rapidly and the foresighted highway official will give careful consideration to this phase of his problem.

French Quarrymen Oppose Modern Roads

Special Correspondence

Owners and operators of stone quarries in France are strong opponents of any move on the part of the government to modernize the highways. The reason is that for years they have supplied the material for the construction of the government's national, departmental and communal roads and that top surfacing, oiling or tarring, though expensive, will threaten their investment. The summation of the protest of the Professional Syndicate of French Quarry Industries is that it needs "encouragement and efficient protection." The Minister of Public Works of France has agreed to consider the quarrymen's case "with liberality." French road engineers are of the opinion modern types are necessary.

From Job and Office

Hints That Cut Cost and Time For the Contractor and the Engineer

Locating Leaks in the Casings of Old Artesian Wells

By W. Mack Angas

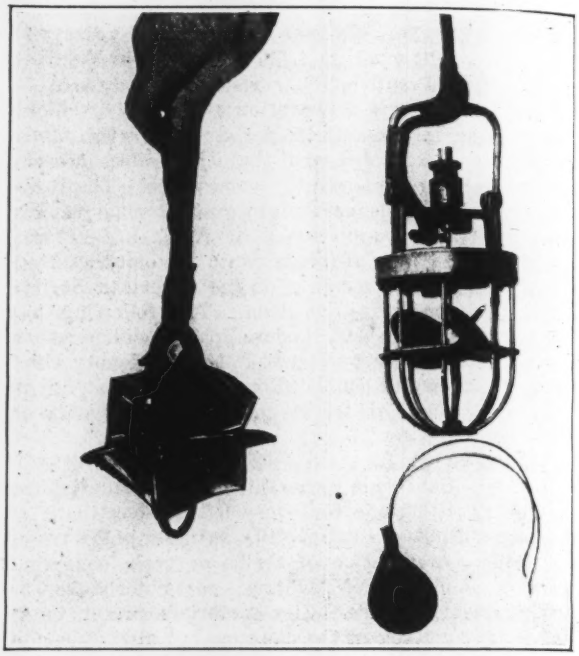
Lieutenant, Corps of Civil Engineers, U.S.N., Pearl Harbor, T. H.

THE ARTESIAN well is such a simple form of water supply that when wells of this type were first driven it seems that the ultimate necessity of renewing or repairing their casings was not appreciated. Modern practice dictates the use of a heavy casing down to bed rock to withstand the corrosive action of the water inside the well and the ground water outside it, and also the use of a casing large enough to permit recasing without reducing the yield of the well to such an extent as to render it ineffective.

Early wells, however, were often cased with piping as light as could be driven without bending and breaking. These light casings are in some localities corroding out with the result that leaks are formed which allow the escape of water into pervious strata above the water-tight stratum forming the top of the artesian basin. In some cases so much water escapes in this way that the well ceases to flow. In small basins like those in the Hawaiian Islands the loss through a number of abandoned and leaking wells may seriously deplete the subterranean supply and in fact threaten the entire artesian system. When a well ceases to flow in Hawaii it therefore becomes a matter of prime importance to determine whether or not the trouble is due to leaks in the casing, and an interesting and ingenious method is used in exploring old wells for leaks.

Fig. 1 is a photograph of the instrument regularly used by engineers of the Geological Survey for locating leaks in old well casings, while Fig. 2 is a photograph of a special instrument made at the Pearl Harbor Navy Yard for exploring an old plantation well which was too small to permit the entry of the regular instrument. Both instruments will of course be recognized as current meters. In the homemade outfit the wheel is an axial flow turbine mounted in a casing improvised from a heavy electric light cage. The commutator for breaking the usual head telephone circuit consists of a cam on the turbine spindle and a small bronze spring mounted on a fiber block acting as a brush. The instrument is lowered into the well by the electric cable to which it is wired. A sash weight not shown in the photograph was suspended from the bottom of the instrument to facilitate lowering it and to minimize the risk of the whole affair being carried out of the well casing and lost in case a large leak were encountered. The more elaborate and precise instrument shown in Fig. 1 is lowered into the well by a long jointed pipe to obviate trouble of this kind.

Both instruments are used in the same general way. Before an exploration is commenced the well is uncapped and if necessary additional casing is added until the top of the casing is at such an elevation that no water flows over it. The meter is then slowly lowered into the well, the lowering being halted for a few moments every 5 ft. or so to enable the operator with the head phones to determine whether or not a leak has been passed. The meter wheel will not, of course, turn except during the actual lowering of the instrument, until a leak has been passed and a consequent upward flow of water to the leak is encountered. As soon as the first leak is encountered the depth to it is recorded and also the speed of rotation of the meter wheel. The rate of flow from the leak may also be determined if the meter has previously been calibrated in a pipe the size of the well casing. The survey is continued to the bottom of the well in the same way, additional leaks making themselves known by increases in the speed of the meter wheel. If a water-bearing stratum from which the well is taking water is passed the speed of the meter wheel will diminish. When the meter is below the bottom of the casing care must be used in interpreting data obtained from the survey as irregularities in the size of the hole in the rock will cause slight variations in the speed of the meter wheel. Such slight variations must be disregarded as long as no consistent change in speed is noted as the survey progresses. With the rough apparatus shown in Fig. 2 a 6-in. well at Pearl Harbor was explored to its full depth of 600 ft. in a couple of days. Valuable data were obtained in this survey which led to the recasing of the well, which had been out of use for years, with the result that the well again flows and affords a most satisfactory water supply for the navy yard swimming pool.



CURRENT METER LOCATES LEAKS IN WELL CASING

Fig. 1: Left—Ordinary current meter mounted for use in a well. The commutator for operating the electrical indicating device is inclosed in the casing. Fig. 2: Right—Current meter built in an old electric light cage. A much less precise instrument than that shown in Fig. 1, but nevertheless a practical one.

Convenient Scheme for Forms on Face of Concrete Dam

IN THE construction of the Weid Canyon dam, a part of the water distribution system of Los Angeles, a simple and convenient system of fastening forms to the upstream face was used (the panels were comparatively small, being only 5 ft. 3 in. long and 7 ft. high), and when the concrete had set could be removed by simply cutting the eight wires with which each panel was held in place. Nevertheless, the system of alignment was such that each tier of panels established the proper position for the one placed next above it and thus a very smooth finish was obtained on the upstream face of the dam.

The first operation in placing each tier of forms was the setting of spuds 3 ft. apart in the green concrete; these were 18-in. lengths of 2-in. pipe and were set 5 ft. back of the upstream face. They afforded reference points whence a check on the upstream face could be made as often as desired; at the same time they provided solid supports for struts and wires holding each tier of panels in place.

The chief feature of the forms was the use of two uprights on each panel extending about 2 ft. above the top of the panel proper, thus affording a means of preserving alignment in the next succeeding tier without the necessity of bolting or otherwise drawing the forms up to grade and alignment.

Notched 2x4-in. blocks were attached to the inside of each panel at points such that when pipe struts of a

FORMS HELD BY STRUTS AND GUY WIRES

certain length were placed between these blocks and the spuds in the concrete the panels would be in proper position. When these struts were placed, the panels were firmly held in the position thus established by twisting up the eight pairs of wires which passed around the pipe spuds and thence around the uprights on the opposite side of the panels. A projection of the upright below the panel bottom prevented "kicking in" of panel bases.

Large nails were passed through holes burned by the oxy-torch in the top of the pipes used as spuds, thus preventing danger of the wires or pipes slipping off the spuds in case of shocks such as might be due to the impact of plums during pouring.

When the fresh concrete reached a point 18 in. below the top of the forms the weight of the concrete made the pipe struts no longer necessary and they were then slipped to one side of the notched blocks and both pipes and blocks were removed.

The panels were given a coating of hydrated lime after each set-up and before the concrete was poured to prevent adhesion to the concrete. These panels had

UPSTREAM VIEW SHOWING PANEL FASTENINGS

sufficient durability to last through the job. They were made up of 1x4-in. tongue-and-groove pine placed vertically and well nailed to a 2x4-in. frame which in turn was solidly bolted to the 4x6-in. uprights.

The work on this dam was under the general supervision of William Mulholland, chief engineer, Los Angeles Bureau of Water Works and Supply; H. L. Jacques was superintendent of construction.

Minimizing Danger of Dynamite Blasts Being Ignited by Lightning

BY R. T. BROWN
Civil Engineer, Greensboro, N. C.

TWO RECENT occurrences in this vicinity have brought to the writer's attention a danger to construction men engaged in electric blasting operations during thunderstorms. The first case occurred on a state highway project in Pickens County, S. C., in a mountainous section where lightning is frequent and violent.

A number of holes were loaded and one lead wire had been connected to the exploder wires. The blasting foreman had hold of the lead wire and was reaching for the battery to connect it when a flash of lightning struck nearby, setting off the blast.

The writer attributes the firing of the exploders to the "return current," that is, a high negative charge was drawn up into objects on the earth by the positive charge in the clouds. When the flash occurred the tension was released, allowing the charge to flow back to the earth. The induced charge in the body of the blasting foreman, who was holding the lead wire, rushed back through the wire and through the exploders to the earth, setting off the exploders in its course.

In the second case, which happened within thirty miles of the location of the first explosion, the holes were loaded at night to be fired in the morning in order to avoid blocking the road over night. During the night lightning struck a tree or rock nearby and set off about half the holes. While there is no way of knowing, it is probable that one of the wires was grounded in the holes set off. No lead wires had been attached.

These two incidents should serve to warn blasters to be very cautious about loading holes with electric exploders and leaving them any length of time in seasons when electric storms occur.

In case a storm comes up while holes are being loaded it would doubtless be well to twist the ends of each pair of exploder wires together and bend them so as to prevent their touching the earth, or any object. There would then be no tendency to completion of a circuit, unless one of the wires should have the insulation worn off and be thus grounded. In no case should the lead wires be attached until the shot is ready to be put off.

Decauville Track Bridge in Persia

IN A COMMUNICATION to the Institution of Civil Engineers Charles E. Capito, a member, describes a Decauville track bridge erected by him in southwest Persia. In this locality rain falls between November and April. The annual rainfall seldom exceeds 20 in. and is often not more than 12 in., but it occurs in periods of one to three days, fine weather thereafter lasting as long as four or six weeks. The country is hilly so that the rivers are torrential, and attain their maximum depth in February and March. During flood seasons roads must either be closed, or bridge structures must be built to carry the road above the highest flood level.

Recently Mr. Capito had occasion to get plant and machinery a distance of about 50 miles from his base, the route traversing a wide river with an average depth in winter of 2 ft. and summer of 10 in.

The crossing of this river was accomplished by building the structure here shown. Some light lattice box girders that had been used for military pontoon bridges were obtained, which were capable of carrying a uniformly distributed load of 50 tons on a span of 28 ft. 10 in., or sufficient to carry the Decauville rolling stock with 7½-ton gasoline engine locomotives.

The bridge was constructed as follows: During the summer low water season the river bed on the line of the bridge was leveled off from the center of the stream to each bank. The girders were then laid on the bed with balks of timber 9 ft. long by 10 in. wide by 6 in. thick under each end of each span. Ten spans were used, the girders being bolted together with 2½-in. by 2½-in. angle fish-plates. On the upstream bottom boom hooked round iron spikes 1¼ in. in diameter and 2 ft. 6 in. long were driven well into the river bed to hold the boom down and also to prevent the bridge from slipping downstream during floods. Five anchors made of old 8-in. pipe were then put in the bed of the river at distances ranging from 100 to 200 ft. upstream, and onto the anchors were fastened old steel drilling cables ⅞ in. in diameter. These were then carried out to the top upstream booms of the girders, tightened by means of a crab winch, and securely clipped to the upper boom. The girders take up very little of the waterway and give the stream ample room to flow both through and over the bridge. In between the bottom booms, over the whole length of the bridge large stones were placed, about ¾ to 1 cu.ft. in size, and welded together with smaller stones.

The rail track was carried on steel longitudinal beams 5 in. x 3 in., bolted to the top booms of the girders, and to these the 20-lb. rails were bolted by special clips. At each end of the bridge wooden ties were spiked down to the river-bed.

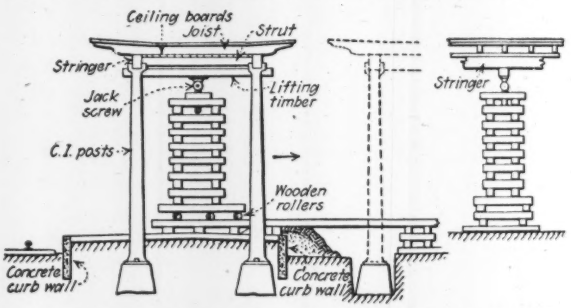
The bridge has withstood the past winter floods very well, and there has been no sign of any movement of any of the girders. The maximum flood so far recorded over the top of the bridge has been 5 ft. Railway traffic over the bridge has been satisfactorily maintained with 9 in. of water over the rails. By planking over the steel ties it is possible to utilize the bridge for ordinary vehicular traffic.

From Job and Office

Hints that Cut Cost and Time

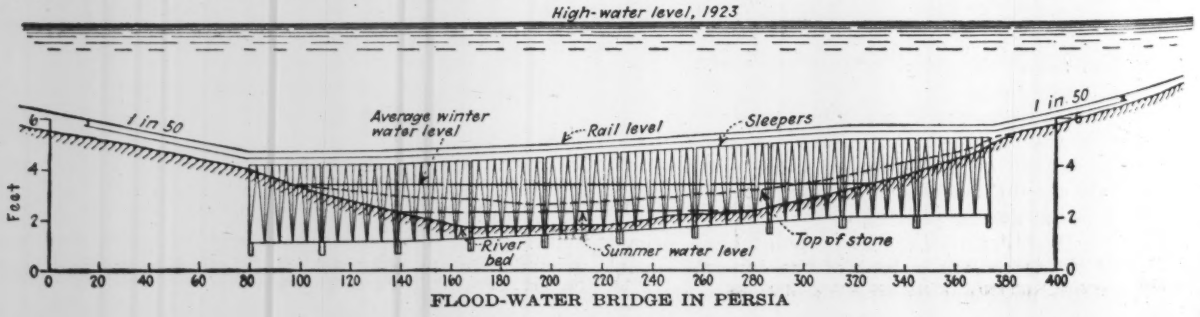
Moving a Platform Shelter

IN FOUR-TRACKING the Chicago & Northwestern Ry. through Wheaton, Ill., it was necessary to move a platform shelter about 12 ft. back to make room for



PLATFORM SHELTER JACKED FOR MOVING

a new track. This was done by jacking it up from the old foundations and rolling it back to its new position, as shown by the accompanying drawing. This shelter is 300 ft. long, with fifteen 20-ft. spans, four of which are enclosed by wire netting and plaster to form a waiting room. Cast-iron posts on concrete pedestals carry timber stringers which are bolted to lugs on the posts, while transverse struts or spreaders are also seated on


High-water level, 1923
1 in 50
Average winter water level
Rail level
Sleepers
1 in 50
Feet
River bed
Summer water level
Top of stone
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400

FLOOD-WATER BRIDGE IN PERSIA

From Job and Office

For Contractor and Engineer

lugs. Across the stringers are joists carrying a plank roof and ceiling boards are nailed under joists.

Concrete footings with anchor bolts in place were built on the new location and the material around the old footings was cleared away, gaps being cut in the concrete curb wall to allow the posts to pass. In the middle of each span a roller path was laid on the brick platform and house-movers' blocking was built up on three wooden rollers. On top of the crib was placed an ordinary screw jack bearing against a cross timber which extended under the roof stringers, raising them and the columns as the jack was turned. The shelter was cut at both ends of the waiting-room, and each of the three sections in turn was jacked up high enough to clear the anchor bolts, then moved over by hand and lowered over the bolts in the new footings. The posts were blocked up at the finished elevation, while the space beneath was filled with grout.

Formwork for Sloping Concrete Roof

IN BUILDING the steeply-sloped slab for the pyramidal roof of the tower of the United Brethren Building at Dayton, Ohio, both inside and outside forms were used and the work was divided into five steps or stages as indicated on Fig. 1. These forms were of wood. Old panels from the lower floors were used as

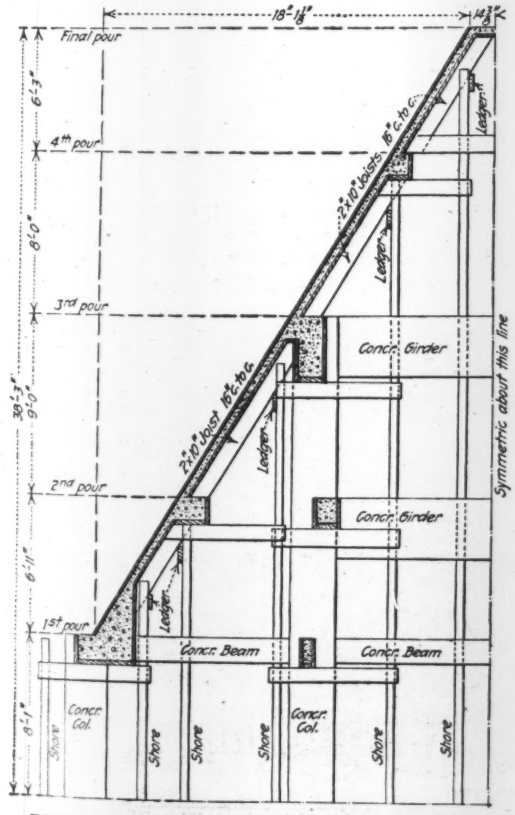
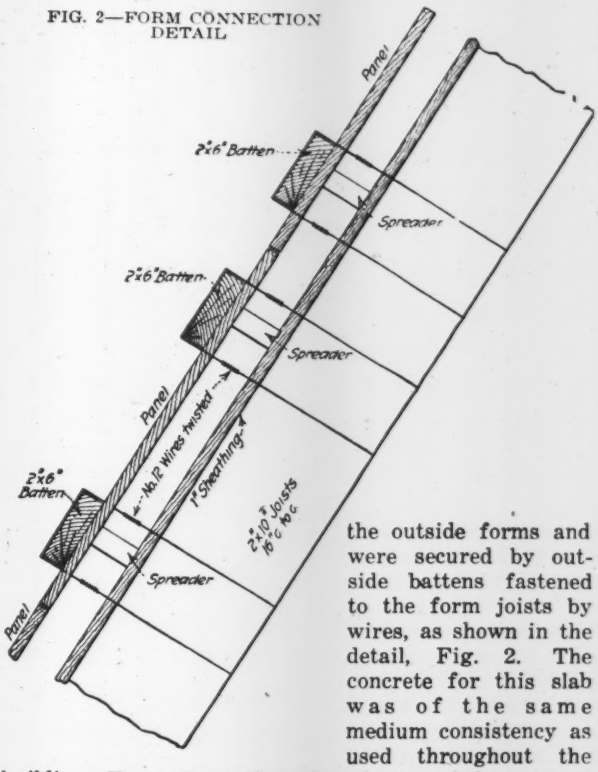


FIG. 1—CONCRETING DONE IN FIVE STAGES

FIG. 2—FORM CONNECTION DETAIL



the outside forms and were secured by outside battens fastened to the form joists by wires, as shown in the detail, Fig. 2. The concrete for this slab was of the same medium consistency as used throughout the building. From the main roof to the top of the tower it was raised by an auxiliary hoist, one buggy at a time.

The building is believed to be the highest reinforced-concrete building yet constructed. It has a total height of 274 ft. 3 in. from the sidewalk to the peak of the tower roof. A story on its construction appeared in *Engineering News-Record*, July 31, p. 177.

Device for Marking Road Center Lines

By A. C. Lagerwall
County Engineer, Shawnee County, Topeka, Kansas

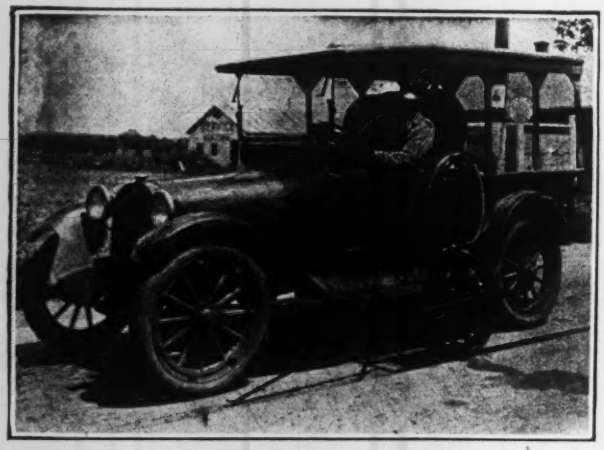
WHAT formerly was a tedious and expensive task has been reduced to an easy and inexpensive bit of work by the perfection of a device upon which months of experimenting were spent. This job is that of marking center lines of pavements, one which has become an important part of highway maintenance.

The device pictured herewith is made so that it may be attached to the running board of any light maintenance truck by two clamps; and it consists principally in the marking wheel, the guide and frame, hose and connections for the flow and control of paint and the paint barrel.

The wheel is mounted in a guide attached to the forward end of the main frame, allowing raising or lowering of the wheel as desired. On one side of the guide is a pivotally-mounted foot which rests on the main frame when the wheel is raised. This foot is about 6 in. above the pavement. The marking wheel itself is of light construction. It is such a diameter that, by employment of the adjusting foot, it can be accommodated to any height of running board. The perimeter of the wheel is covered with a ½-in. layer of felt for the full 3½-in. width of the wheel.

Paint flows by gravity from the barrel in the truck to the nozzle above the marking wheel, and thence to the pavement by the revolving wheel.

By use of this outfit it is easily possible to mark about 15 miles of center line per day of eight hours. The average cost, not including the cost of paint, is about 50c. per mile. The amount of paint necessary for a line of 3½-in. width is about 3 gal. per mile. The size of barrel in the truck is such that a day's supply can be carried at one filling. The device may also be adapted to maintenance and refilling of the longitudinal joints in concrete pavements.



MECHANICAL MARKER FOR ROAD CENTER LINES

These machines are being placed on the market by the Capital Iron Works, of Topeka, Kan.

Fords and Turntable Used to Advantage in Tunnel-Lining Job

FORD TRUCKS and a turntable were used to good advantage recently in delivering cement, sand and rock to a mixer which supplied concrete for lining a 1,500-ft. tunnel on the new sewer system being built by the city of Los Angeles. The tunnel was so well ventilated, due to the fact that it was close to the ocean beach where a breeze was almost steadily blowing through it, that no trouble from carbon monoxide was feared. The mixer was mounted on wheels and taken into the tunnel; the trucks delivered materials to it there. The plan was an entire success and concrete was placed at an average rate of 150 cu.yd. per 8-hr. day with a maximum of 25 cu.yd. per hour. The concrete mixer was started at the opposite end of the tunnel from the cement sheds and aggregate bins and worked back toward them.

The trucks, cut down and equipped with special bodies, measured 12 ft. 6 in. over all and cost about $700 each. Their bodies were divided into two compartments; when the tailgate was opened, the load in the first or rear compartment was dumped into the mixer hopper and thence into the mixer while the truck waited. The hopper was then let down again, and the load in the second compartment of the truck was discharged into the hopper to be kept in storage there until the mixer was ready for the next charge. By this plan and with a little co-ordination of the crews, there was a minimum of delay of trucks and mixing crew.

The trucks ran in and out of the tunnel on a runway made of 2x12-in. plank spiked to 2x12-in. sleepers, the spikes being covered with 2-in. metal straps to avoid danger of puncturing tires. Three planks were placed in the center and two at each side, thus allowing sufficient space for the trucks to pass anywhere along the line. At the delivery end of this track was the turntable, approached by a ramp built of 2x10-in. plank, 4 ft. long, placed on edge and bolted together. The truck ran up this ramp onto a pair of channel irons mounted on a turntable where it was turned with the rear end toward the mixer so that loads could be dumped directly into the hopper.

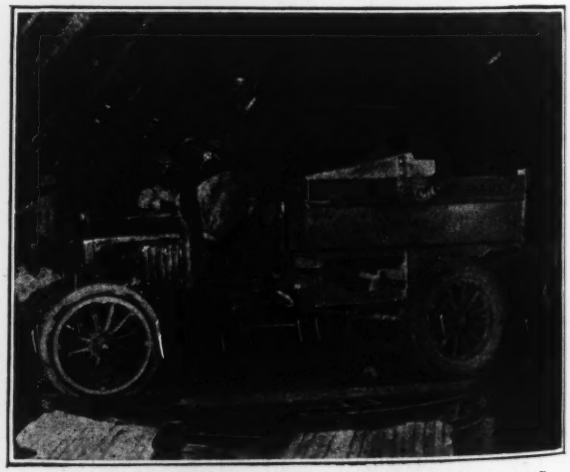
From Job and Office

Hints that Cut Cost and Time

The turntable was mounted on skids made of structural steel and shod with ⅝-in. plates 18 in. wide and 9½ ft. long, thus making it convenient to slide it ahead as the work progressed. Rigidly attached to the skid frame were eight radial shafts extending from a central spindle to a ring made of angle iron and having a diameter about equal to the length of the skids to which it was riveted. These shafts carried 6-in. cast-iron rollers with 2¼-in. faces on which the upper or rotating part of the platform turned.

The upper part of the runway frame consisted of two 10-in., 15-lb. channels placed at the proper spacing and with the flanges up to form tracks for the truck wheels. These channels were riveted to a central transverse member and on the underside of the frame thus formed a ring, made of light T-rail with the head of the rail down, was bolted to the frame. This circular rail rested on the wheels of the skid frame and thus enabled the runway frame to rotate about a central spindle 3 in. in diameter, projecting upward from the skid frame through a collar fastened in the center of the runway frame. With this arrangement the weight of the rotating element was carried partly on the rollers at the periphery and partly on a shoulder of the central shaft. By using an inverted rail moving over rollers difficulty was avoided with sand, dirt or other obstructions collecting on the track. A loaded truck was easily turned on this turntable by one man. The diameter of the turning circle was 13 ft. 5 in. or 5 inches less than the width of the tunnel inside the plumb posts.

The tunnel lining required about 3 cu.yd. of concrete per lineal foot (including the invert). A crew of six men in the tunnel (exclusive of truck drivers) would



TRUCK TURNING IN TUNNEL BEFORE UNLOADING
Note ramp of planks on edge in foreground. Hopper of concrete mixer in background.

From Job and Office

For Contractor and Engineer

PLANK RUNWAY FOR TRUCKS DELIVERING IN TUNNEL

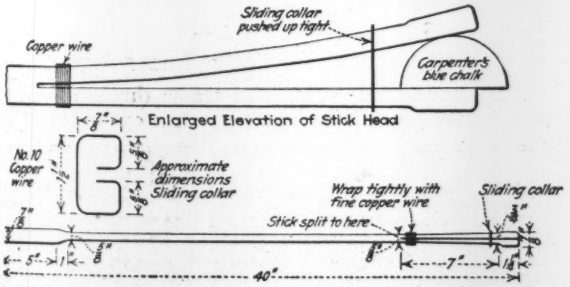
advance an average of 50 ft. per 8-hr. shift. Four trucks were equipped for this job, one being held in reserve as spare and three being used to maintain a steady supply of materials for the mixer.

The work is being done by force account under the direction of H. A. Van Norman, consulting engineer for the city of Los Angeles in charge of sewer construction.

Marking Defective Brick in Road Building in Amarillo, Texas

By Marvin C. Nichols
Assistant City Engineer, Amarillo, Texas

In order to make it somewhat easier on the inspector of brick pavement during construction, a "marking stick" has been devised by the engineering department of Amarillo, Texas. Carpenter's blue chalk is used in marking the defective brick. Ordinarily, the continuous stooping to mark condemned brick makes the work very tiring for the inspector. With the use of this device the inspector walks in an upright position. It has been our experience that brick can be more efficiently inspected and culled by the inspector when provided with a stick of this character. J. C. Benko of this office made the sticks from straight grained hickory buggy reaches, turning them out on an ordinary wood lathe.



DETAILS OF BRICK MARKING STICK

Job and Office Notes

Expansion and Contraction in guy lines is often considerable. If one guy line is in the sun and the other in the shade, the effect is particularly noticeable. Differences of temperature from one day to the next may also have effect. Such expansion or contraction can be easily taken care of, says a recent issue of *Rock Products*, by the use of an old car spring. One end of the car spring is anchored to the deadman and its other end fastened to the guy wire. The tension is such that any contraction or expansion is easily taken care of.

Two Whole Days' Time in concrete road work were saved by the application of an ingenious means of keeping a mixer in operation when the sprocket had broken, according to George E. Wright, assistant city engineer of Gloversville, N. Y. The bucket operating mechanism on the paver being used was driven by a chain from the main jackshaft. The sprocket on this jackshaft broke, making replacement necessary or substitution of manual for mechanical means. As replacement of the sprocket was impossible within two days' time, inasmuch as one was not at hand, two sets of tackle blocks were fastened to the discharge bucket. One set was fastened to the end of the boom and to the bucket for handling the bucket out from the paver to its dumping position. This was a four-part tackle. The other set was fastened to the mixer frame and to the bucket for hauling the empty bucket in the mixer for filling. This was a two-part tackle. Though at each dumping of the bucket a distance equal to four times the length of the boom was traversed, there was no difference noted in the amount of paving laid by the manual over the mechanical method of operating the bucket. The paving was done by the city of Gloversville under contract by Keotteritz & Blakeslee, of Little Falls, N. Y.

Contractors Engaged in River Protection or harbor work may be interested in a system of making rough concrete blocks explained in a recent issue of the *Military Engineer*. The idea was first suggested by Major (now Colonel) Earl I. Brown, district engineer, a number of years ago on Alabama River improvement work. The work of improvement on the river consisted mainly of construction of spur dikes or jetties and snagging. For considerable distances on the river there is no rock except a soft soapstone which disintegrates when exposed on the jetties, thereby making it unsuitable for jetty construction. In order to avoid barging rock long distances on the river, what were called "one man" concrete blocks were made. In the river are various sand and gravel bars which are several feet above the low water level. In many places this sand and gravel is already mixed in the proper proportions for making concrete. Small holes spaced about 2½ or 3 ft. on centers are prepared in rows on the bars. About 1½ gal. of water (the exact amount varying wtih the moisture of the bar) and an 8-lb. cup of portland cement are poured into each hole and mixed with the sand and gravel by shoveling before the water has had time to soak into the ground. The result is a mushroom-shaped mass of concrete about 20 in. in diameter and 12 in. thick. Blocks are allowed to dry and remain in place about three days when they are sufficiently hard to be turned over with a pick. They are then allowed to harden in this position for about three more days when they are loaded on wheelbarrows and placed on a barge. In an emergency the time allowed for setting can be somewhat reduced. While blocks are hardening on one part of the bar, new ones are being prepared in another part. Ordinarily seven men are engaged in mixing the concrete and seven more in carrying water, mixing the cement and water and pouring it into the holes. An average day's work of 14 men is 1,400 blocks or about 107 tons. The manufacturing cost per ton will average $2.25 with an additional cost of about 20 cents per ton for loading on barges.

Letters to the Editor

This department aims to be a forum for the discussion of the views of engineers and contractors. The range of interest should be as wide as possible. Contributors are, therefore, asked to make their letters short.

Is the Pittsburgh Plus Decision Price Fixing?

Sir—The decision of the Federal Trade Commission in eliminating "Pittsburgh plus" raises many interesting questions that should have discussion in your columns. The decision reads in part, page 8, paragraph (g):

> "When these findings speak of the plus or imaginary freight charge as being eliminated, the assumption is that respondents' Chicago mills will charge a base price at Chicago which is the same as their base price at Pittsburgh."

This seems the key to the decision. Has the Federal Trade Commission the power to thus fix prices on the theory that any other prices would be discriminative?

If a contractor builds a bridge in California for a definite contract price, must he charge that same price in Indiana where the cost is far less? Or is there some distinction between this assumed case and the decision in that there must also be a suspicion of collusion with other contractors?

On page 202 of your July 31 issue, you quote the opinion of the commission, as follows:

> "It was found that the plus system permitted the Pittsburgh competitors of the Western steel users to share the Western territory, but prevented the Western steel users from sharing the Pittsburgh territory, and prevented the Western steel users for the most part from competing east of their plants."

Is not this merely another way of saying that the supply of steel from Pittsburgh was so great that it overflowed into other producing districts?

It is my understanding that steel actually is shipped from Pittsburgh past Chicago to such a point as Omaha. It is also my understanding that the cost of production is 20 per cent less at Chicago and that Pittsburgh plus does not affect the *cost;* if then Chicago is able to supply all the steel needed at Omaha and the west, why should any manufacturer ship steel from Pittsburgh at a cost 25 per cent higher?

The answer of the Federal Trade Commission seems to be that Pittsburgh plus by affecting the selling price, makes the producer want to lose 25 per cent on his cost of production. Is this correct? Does it mean that if one can make enough by raising his selling price, he will care nothing about his cost of production?

Again on page 202, you quote the commission:

> "(a) It will build up all steel producing and consuming sections outside of Pittsburgh, which are now held back by that system."

I understand this to mean that by eliminating Pittsburgh plus and forcing a reduction in price for steel at Chicago, steel producers will be induced to go there. I do not understand just why a steel producer should want to go where his prices and profits will be reduced.

The decision applies to interstate commerce alone. This may mean that the United States Steel Corporation, against whom alone the decision applies, may charge Pittsburgh plus prices in its home states but must charge Pittsburgh *base* prices when any of its mills ship across a state line. This seems a sufficient reason for the intense interest of Chicago in this matter. Shall all fabricators of steel move to Chicago to gain this advantage at the same time that the rolling mills are not encouraged to go there? Where then will the fabricators get their steel? From Pittsburgh, plus the freight?

Does it follow that "Tulsa plus" for oil must now be abandoned? Or does the fact that there are independent oil companies producing in other states than Oklahoma, while the Standard Oil Co. may have been dissolved into its elements, create a different situation?

May the United States Steel Corporation sell its Chicago mills to a separate corporation and then restore Pittsburgh plus prices?

If the federal government may thus fix prices at Chicago making them the same as at Pittsburgh where the cost is admittedly 25 per cent higher, will this not be an excuse for an alleged monopoly to maintain that price at Chicago even after competition might otherwise have reduced it far below the Pittsburgh base price? Will not the same tedious organized effort of five years again be necessary to upset what has now been done?

Your editorial July 31, 1924, says: "Every finding in the decision makes spoken or unspoken reference to fairness." The Clayton anti-trust law under which this decision was rendered, was passed at the behest of trade union organizations in the interest of fairness (to themselves), to prevent application of the Sherman anti-trust law. They did not succeed, but it will be evident at once that there are various definitions for fairness.

Might not the Federal Trade Commission adopt this very method of continual reference to fairness to prevent criticism of a decision that will surely become epoch making if it succeeds in taking over a function of government rarely exercised, except in time of war—that of fixing prices?

The newspapers of the West and the public seem to have been influenced in favor of the decision by the mention of a saving of $30,000,000 to their section of the country. Under the circumstances the United States Steel Corporation may not consider it worth while to arouse antagonisms by an appeal.

If the case is appealed, must the Federal Court of Appeals and then the Supreme Court of the United States bear the brunt of criticism in case the decision is reversed in the face of all the sentiment that has been built up by the Federal Trade Commission in favor of this particular fixing of prices? Shall we then have more demand for a review of Supreme Court decisions by a Congress more responsive to the minority demands?

Should not the test of Pittsburgh plus be the determination of whether or not Chicago actually is able to supply the demands of all districts west of Chicago, except for Pueblo, and of part of the district east of Chicago?

Indianapolis, Ind., Aug. 4, 1924.

DANIEL B. LUTEN, Consulting Engineer.

[The quotation given from paragraph (g) is only a part of that paragraph. The rest is as follows: "If the Chicago base price were lower than the Pittsburgh base price, of course, the advantage of the Western fabricators would increase over the figures above set out. The cost of producing steel at respondents' Chicago mills is much lower than at their Pittsburgh mills."

The reference to a common price is therefore not a part of the decision but merely a part of the contingent argument.—EDITOR.

Panama Canal Traffic Increasing

The increase in commercial traffic through the Panama Canal, so notable last year, has continued at the same rate this year. The increase in the number of vessels and net tonnage this year is practically the same as the increase of 1923 over 1922. The accompanying table is from the *Panama Canal Record.*

Fiscal Year Ending June 30	Number of Transits	Panama Canal Net Tonnage	Tolls	Tons of Cargo
1915[1]	1,075	3,792,572	$4,367,550.19	4,888,454
1916[2]	758	2,396,162	2,408,089.62	3,094,114
1917	1,803	5,798,557	5,627,463.05	7,058,563
1918	2,069	6,574,073	6,438,853.15	7,532,031
1919	2,024	6,124,990	6,172,828.59	6,916,621
1920	2,478	8,546,044	8,513,933.15	9,374,499
1921	2,892	11,415,876	11,276,889.91	11,599,214
1922	2,736	11,417,459	11,197,832.41	10,884,910
1923	3,967	18,605,786	17,508,414.85	19,567,875
1924	5,230	26,148,878	24,290,963.54	26,994,710
Totals	25,032	100,820,397	97,802,818.46	107,910,991

[1] Canal opened to traffic August 15, 1914.
[2] Canal closed to traffic approximately seven months of fiscal year by slides.

News of the Week

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Need for Parking Space Becomes Acute in Washington

Washington Correspondence

The Commissioners of the District of Columbia are considering drastic action to provide space for the parking of automobiles. Plans which have been submitted by the engineer commissioner and the chief of the traffic bureau of the Police Department to provide an extensive program of widening streets and the use of extensive areas in parks where motor cars may be left. One phase of the plan provides for the widening of K St. so as to allow 37 ft. 8 in. in the center of the street for parking purposes. By setting back the sidewalks slightly a width of 97 ft. 8 in. can be obtained. This will allow a 30-ft. roadway on each side of the parking space in the center of the street.

Consideration also is being given to the establishment of municipal parking spaces in the center of blocks. In such areas, however, a nominal charge would be made for the parking privilege. The use of space in the center of blocks already has attained some proportions as an enterprise for private gain.

In many instances a charge of $10 per month is made for parking space. In some instances it has been found more profitable to use the ground for parking purposes than as sites for warehouses and storage rooms. Such structures are being torn down so as to make the ground available for open storage of automobiles.

Seek Power Permit on Green River

An application for a preliminary permit covering a 60,000-hp. development at the Split Mountain site on Green River in Unitah County, Utah, has been filed with the Federal Power Commission by A. E. Humphreys, of Denver, and by J. H. and Mary E. Ratliff, of Vernal, Utah. The proposed project conflicts with plans of the Utah Power and Light Co. and would not be of particular interest were it not for the fact that the applicant is known to possess large financial resources. Mr. Humphreys and his associates propose to use power in the manufacture of fertilizer at their nearby phosphate properties. In addition, however, it is proposed to divert sufficient water to irrigate 3,000 acres on the east side and 8,000 acres on the west side of Green River. The Utah Power & Light Co. is actively working on the plans for a project at the Flaming Gorge site several miles above Split Mountain. The Split Mountain site probably would be the next step in the power company's expansion along the Green River.

Garbage and Refuse Problem to Be Studied at Kansas City, Mo.

A comprehensive survey and report on the collection and disposal of garbage and rubbish in Kansas City, Mo., have been decided upon by the Hospital and Health Board, which has engaged Black & Veatch, consulting engineers, Kansas City, for the purpose. The engineers named have arranged with Samuel A. Greeley, consulting engineer of Chicago, to join with them in the study. It is expected that a report will be completed about Dec. 1.

Southern Ry. to Build New Shops

Contract for the design and erection of new locomotive repair shops at Atlanta, Ga., has been let to the Foundation Co. by the Southern Railway. The main shop building is to be a double transverse erecting and machine shop, 325 ft. long and over 300 ft. wide. It will be of steel construction with brick walls, and will have two 200-ton electric traveling cranes and several smaller cranes, some inside the building and some outside. Plans are being prepared in collaboration with the engineers of the Southern Railway and it is expected that work will begin by Sept. 1 and will be completed in six months' time; the total cost will be about $750,000.

Colorado River-Los Angeles Aqueduct Line Surveyed

Field and office crews employed by the city of Los Angeles are working up data on the plan to build an aqueduct that would bring Colorado River water to the city of Los Angeles. The field and office work which will be finished late this fall will consist in part of a map on a scale of 1 in. to 10,000 ft. showing the proposed route from a diversion between Blythe and Parker on the Colorado River to reservoirs in the foothills near Los Angeles, a total distance of about 225 miles.

The aqueduct would have a capacity of 1,500 sec.-ft., and would reach its highest elevation at Shaver Summit, El. 1,700, which is 70 miles from the intake and about 1,400 ft. above it. The lift to this summit would be made by pumping plants along the 70-mile length of aqueduct, three or four plants being required. From Shaver Summit the flow would be by gravity. A total of 40 to 50 miles of tunnels would be required in the proposed location. These would be chiefly in short lengths except for one bore near Cabezon with a minimum length of 13 miles. No definite estimate of cost has yet been made but it is understood that this will be placed somewhere between $100,000,000 and $200,000,000, probably nearer the lower figure.

Rensselaer to Celebrate Hundredth Anniversary

Educators and Technical Men of World-Wide Reputation To Aid in Celebration Oct. 3-4

The program has been announced for the Centennial celebration which Rensselaer Polytechnic Institute will hold Oct. 3 and 4 at Troy. Numerous official delegates will be present from educational institutions, scientific organizations and engineering societies throughout the world as well as from each alumni association and from each class since 1857.

Among those scheduled to speak on the first day are: Herbert Hoover, Governor Smith, of New York; Harry E. Clinton, mayor of Troy; F. P. Graves, president of the University of the State of New York; Sir Charles Langbridge Morgan, president of the Institution of Civil Engineers of Great Britain; Henri Abraham, president of the Society of Electrical Engineers of France; Luigi Luiggi, president of the Society of Civil Engineers of Italy; Roberto Gayol, president of the Society of Engineers of Mexico; and Arthur Surveyer, president of the Engineering Institute of Canada.

Pageant to Close First Day

During the afternoon of Oct. 3, unveiling ceremonies will be held, at which addresses will be made by Mrs. James Carroll Frazer, a lineal descendant of Stephen Van Rensselaer, founder of the Institute, and by Dr. S. K. Alfred Sze, Chinese Minister to the United States.

During the evening of the first day, a dinner will be given at the state armory, and addresses will be made by President Livingston Farrand, of Cornell University, and Director Joseph H. Odell, of the Service Citizens of Delaware.

A pageant on the campus illustrating several scenes in the history of science and engineering during the last century will be closing features of the first day's ceremonies.

During the second day, the morning will be devoted to addresses from the presidents of the following educational institutions and scientific and technical societies: Yale University, University of Wisconsin, Massachusetts Institute of Technology, American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers, American Institute of Electrical Engineers, and National Academy of Sciences.

In the afternoon a reception will be held by President Ricketts and Mrs. Ricketts and the two days' ceremony will close with a pageant and alumni smoker.

Nickel Plate Acquires Erie and Pere Marquette

Enlarged System Now Includes Seven Railroads — Total Main-Line Trackage Over 9,000 Mi.

Confirmation of the proposed merger of the Erie and the Pere Marquette with the enlarged Nickel Plate system was made semi-officially on Aug. 8. Negotiations between the directors of these two railroads and the Van Sweringens of Cleveland have been in progress for some time. Their culmination is this announcement, by the interested bankers, of the basis for the exchange of stock. Before the merger can be put into execution the plan will have to be approved by the Interstate Commerce Commission.

If the merger is approved and put into effect the Nickel Plate system will include the New York, Chicago & St. Louis, the Toledo, St. Louis & Western, the Lake Erie & Western, the Chesapeake & Ohio, the Hocking Valley, the Pere Marquette, and the Erie. (Control of the Chesapeake & Ohio and the Hocking Valley passed to the Van Sweringens some month ago.) The total main-line mileage will be 9,314 and the total of all tracks over 14,000 miles. The system will reach the cities of New York, Buffalo, Cleveland, Chicago, St. Louis, Toledo, Detroit, Cincinnati, Washington and Newport News. The Erie now has access to Pittsburgh over the Pittsburgh and Lake Erie.

Under the Interstate Commerce Commission's plan for the consolidation of the railroads of the country into several systems the Lehigh Valley was used as the eastern connection for the New York, Chicago & St. Louis, the Toledo, St. Louis & Western and the Lake Erie & Western, with the Pittsburgh & West Virginia, Wheeling & Lake Erie and Bessemer & Lake Erie as feeder lines.

Professor Ripley's plan used the Delaware, Lackwanna and Western as the eastern stem of the system and added the Buffalo, Rochester & Pittsburgh, the Philadelphia & Reading and several smaller lines including the Western Maryland to give the system a second Atlantic seaport at Baltimore. The new system will have its second seaport at Newport News and will have a splendid low-grade line from the West to New York.

Both the I. C. C. plan and Professor Ripley's plan use the Pere Marquette as the basis of an independent system in the Michigan peninsula.

Asphalt Association Appoints New Field Engineers

Changes in field personnel and consolidation of the Newark, N. J., branch office with the main office in New York City are announced by the Asphalt Association. Vibert L. Ostrander, formerly first deputy commissioner, New York State Highway Department, becomes manager of the Eastern District with headquarters at 25 North Pearl St., Albany, N. Y., to succeed Germain P. Graham who has resigned to enter private practice. Frederick A. Reimer has resigned as manager of the New Jersey district to enter private business and W. C. Ricketts has succeeded Harry P. Grier as a field representative in the Southern district, with headquarters at Charlotte, N. C. W. A. Crossland also has accepted a position with the Southern branch. Frederick C. Field, until recently with the city engineering department at Calgary, Canada, has been appointed field representative in Canada, traveling out of the main office in New York.

New Explosive for Road Work to Be Distributed at Cost

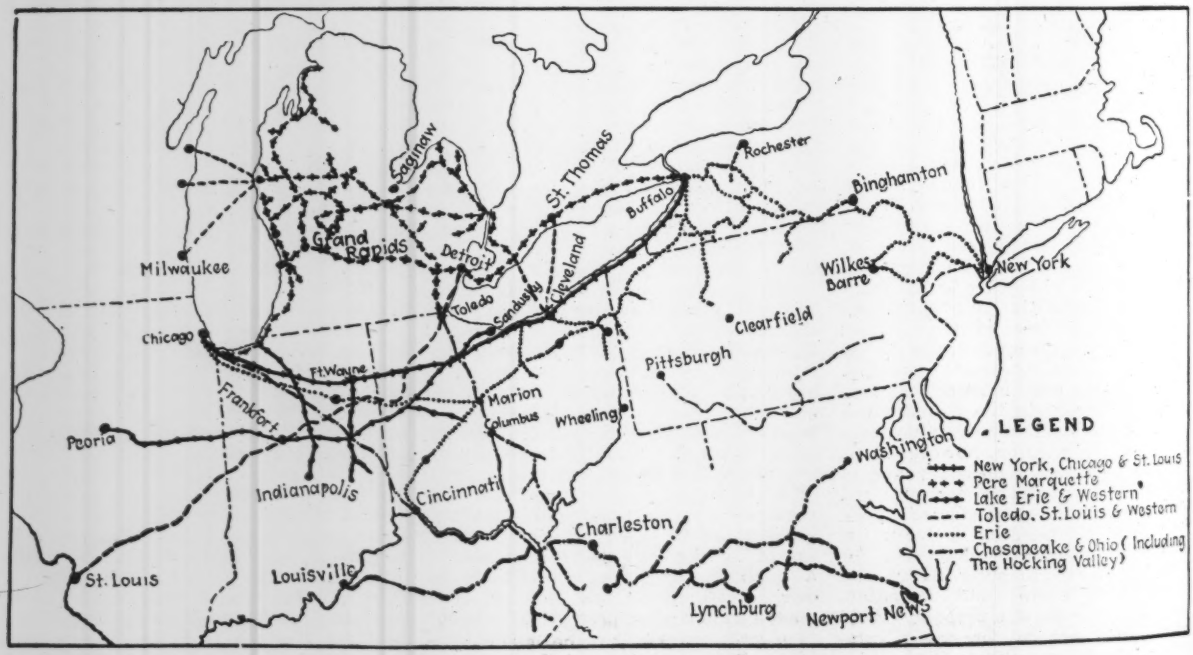
One hundred million pounds of a new explosive made from surplus war supplies is shortly to be made available to the states and federal government for road construction and to farmers for land clearing. This explosive, pyrotol, is to be distributed by the U. S. Bureau of Public Roads at the cost of preparation and shipment.

Pyrotol is composed largely of ground smokeless powder prepared by a process perfected by George R. Boyd of the Bureau of Public Roads. It is said to be peculiarly adapted to the blasting of stumps and work of similar character. The cartridges are of the same size and shape as the ordinary dynamite cartridge, and are equal in strength to cartridges of 20 per cent dynamite.

There is no charge for the explosive itself, but the consumer has to pay the cost of preparation and the freight charges. The cost is about half the cost of an equivalent amount of commercial explosives. The Department of Agriculture can not accept orders for pyrotol except through state agencies.

Large Drydock for Kingston

Plans are under way for the building in Kingston, Ontario, of an immense drydock, with four times the capacity of the present drydock and to cost approximately $4,000,000; the dock to be completed and ready for operation at least by the time the enlarged Welland Canal is opened, if not sooner. The dock will be built by the Kingston Shipbuilding Co. It will be 700 ft. long and will be able to accommodate two of the largest lake vessels at one time.



RAILROADS TO BE COMBINED IN THE PROPOSED NICKEL PLATE SYSTEM

Railroad Provides Air Service Into New Territory

Probably the first regular air service to be operated in conjunction with a railroad is that provided by the Canadian Pacific Ry. in co-operation with the Laurentide Air Service Co., from Angliers, the end of the C.P.R. line in northern Quebec, to the Rouyn gold fields. According to the *Canadian Railway and Marine World* this service was put into effect in June, and in July was extended to serve the Canadian National Ry. at Haileybury, Ont. Hydroplanes are used for the service, leaving the rail heads Monday, Wednesday and Friday and returning Tuesday, Thursday and Saturday. Single fares are $40 and $60 respectively, with 25 lb. of baggage free and excess baggage 20c. per pound.

Some freight is also being carried at 20c. per pound for parcels not exceeding 100 lb., with a minimum charge of $2.50. The trip takes only two hours from Angliers to Lake Fortune and two hours and fifteen minutes from Haileybury to Lake Fortune.

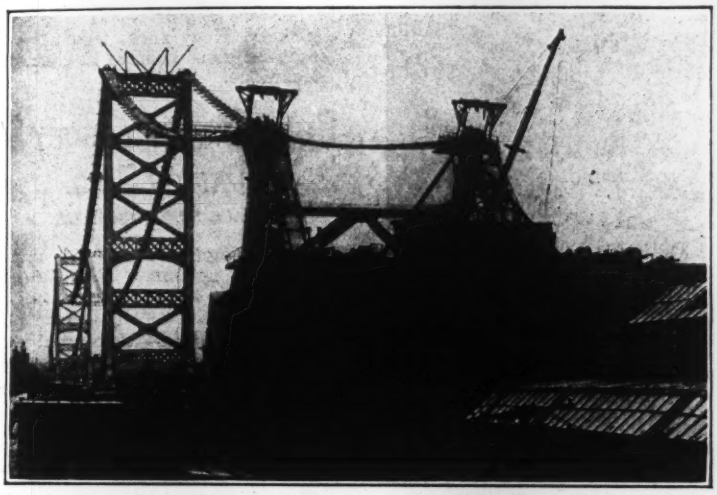
North Jersey Transit Commission Begins Its Work

The North Jersey Transit Commission, which was created by an act of the New Jersey Legislature in 1922 but which was not provided with funds until this year, has organized its staff and commenced its studies looking toward the improvement of transit conditions in the parts of New Jersey included in and adjacent to the metropolitan district of New York. Charles N. Green of Newark is chief engineer, Daniel L. Turner is consulting engineer, and the commissioners are Bertram H. Saunders of Paterson, chairman, Archibald M. Cox of Plainfield, Walter M. Dear of Jersey City, Spaulding Frazer of Newark, D. A. Garber of Ridgewood, Hally Hatcher of Hoboken, and Herbert S. Swan of East Orange. A. W. Coffin of East Orange is executive secretary to the commission.

Work Starts on Stringing of Main Delaware River Bridge Cables

The temporary timber footbridges for construction of the main cables of the Delaware River Bridge were completed last week, and work was started on stringing the wires of the main cables. Completion of the footbridge for the south cable was celebrated last Friday by an inspection of the work by the Delaware River Bridge Joint Commission.

The footbridges are each 10 ft. in width, with flooring of 6-in. boards spaced 2 in. apart. Each footbridge is supported by six 2¼-in. steel cables, arranged in two sets of three cables each. These cables will later be used for suspender wires in the bridge structure. Three crossovers in the main span, and one in each side span, made of timber truss construction, are provided to make convenient access between the two footbridges and to brace them against side sway. Storm cables to reduce the sway in each footbridge are also provided. The haulage ropes for stringing the cable wire are supported on steel framing at the tops of the anchorage cable bents and the main towers, and on intermediate timber towers erected upon the footbridges.



FOOTBRIDGES STRUNG ON DELAWARE RIVER BRIDGE: CAMDEN SIDE

Films Will Preserve Present-Day Construction Methods

To preserve for the study of future generations twentieth-century methods of construction, the Rothacker Film Manufacturing Co. of Chicago has perfected a process whereby films showing present-day building can be preserved thousands of years. The film manufacturing company has taken a number of construction photographs, which it will present to the Smithsonian Institution. Not only will construction methods be pictured, but the processes entering the manufacture of materials used. In order to perfect the process of preserving the film, the laboratories of the company first aged the films and then rejuvenated them.

Moffat Tunnel Work Ahead of Contract Schedule

Project May Be Completed Months Before Completion Set Forth in Contract

Progress on the Moffat Tunnel through the Rocky Mountain range near Denver, Colo., is well ahead of the schedule laid out by the Moffat Tunnel Commission in the construction contract with Hitchcock & Tinkler, Inc. In fact, the indications are that, unless unforeseen difficulties arise at greater depths, the tunnel will be completed some months before July 20, 1927, the date set for completion of the contract. Up to Aug. 1, 1924, the progress was as follows:

The 8 x 8-ft. water tunnel or pilot tunnel had been completed for 4,135 ft. from the east portal and 3,930 ft. from the west, the total being 25 per cent of this part of the work; of the cross cuts from the pilot tunnel to the main tunnel, 378 ft. had been driven, or 31 per cent of the required total; for the main tunnel, 3,960 ft. of the center heading, 7½ ft. high and 9 ft. wide, had been driven at the east end, and 2,466 ft. at the west; of the 32,250 ft. of full-size railroad tunnel, 1,087 ft. had been finished from the east portal and 481 ft. from the west portal. It is pointed out that progress on the full-size bore is naturally behind that of the headings under the center heading system, in which ring shooting around the small bore breaks down the remaining rock to 16 ft. x 24 ft.

Heavy Timbering Required

Disintegrated quartz-biotite gneiss encountered at the west end has necessitated heavy timbering for the first 3,300 ft. Native pine is being used for this timbering in the temporary headings and Oregon fir in the permanent tunnel. In cross cuts, in spite of 3-ft. spacing of sets, pressures have developed which demand either continuous lining or reinforcement by steel beams, or both. Except in heading No. 3 east at the west end, comparatively little water has been encountered. The timbering has required extra labor, so that while the average number of men employed at the east portal has been 200, the average at the west has been 300 to 350.

Camps and plant installation are virtually complete, and additional muck trains have been added recently to handle the long hauls. At the west portal, muck from four main headings, as well as from the water tunnel heading, is being transported out through the water tunnel by storage battery locomotives. This leaves only the muck moved by the air shovel at the breast to be handled through the main railroad tunnel.

The use of drill carriages on which mounted drills, ready for hose connections, can be transported back and forth between water tunnel and main headings, alternating with the muckers, has facilitated setting up. In addition, belt-conveyor mucking machines have reduced the time of clearing up after shots. The bonus is said to be proving an incentive to record-breaking work.

Col. Kelly Gives Views on St. Lawrence Project

Project Should Be Started at Once, Says Army Engineer—Suggests 30-Foot Depth for Channel

Washington Correspondence

Before much further progress can be made in the investigation of the St. Lawrence project, extensive boring must be done, not only of dam sites, but at points where navigation structures are proposed, in the opinion of Col. William Kelly, chief engineer of the Federal Power Commission and member of the St. Lawrence Joint Engineering Board.

The Canadian sector of the improvement has been bored fairly well, Col. Kelly says, except in the channel of the stream. The Canadians, he points out, have had at their disposal an appropriation of $50,000 a year for five years for this investigation. The amount has been increased to $100,000 this year. There is urgent need that corresponding field work be done on the American side. In his opinion every effort should be concentrated on the steps necessary to bring in at least a part of the power at the earliest possible time. Since no less than ten years will be required before any power is made available, he anticipates that the power requirements of that portion of the United States which the project will serve will have reached a point where the need for it will have become acute.

In view of the probability that a much longer period may have to elapse before any of the St. Lawrence power is made available, because of the delays inherent in the securing of legislation and in the preparation and ratification of treaties, Col. Kelly suggests that no time should be lost in the necessary preliminary studies and investigations.

Discusses 30-Ft. Channel Depth

Those interested in this project at this time should be giving careful consideration to some of the major policies which must control this development. One of these is whether or not the St. Lawrence should be deepened at this time to a depth greater than 21 ft., the prevailing depth in the Great Lake channels and ports. A sizable commerce does not develop at sea coast points until a depth of 30 ft. has been attained. However, it is possible that the requirements of the St. Lawrence situation would be met by a 21ft. depth, since the proportion of ocean vessels drawing less than that depth is ample to handle the tonnage which would move by this route, but judging from experience with channels elsewhere, the public demand is not met until 30 ft. has been provided. An early estimate should be made, Col. Kelly thinks, of the relative cost of making the 30-ft. development as a part of the initial project and its cost if made later, after the 21-ft. channel has been tried out thoroughly. The deepening of lake harbors could be conducted gradually. Only two or three harbors probably would have immediate demand for 30 ft. of water.

Condition of Nipigon River Power Development Improved

The third unit of the Nipigon River plant of the Ontario hydro-electric system has been put into operation, bringing the power capacity of the development up to 37,500 hp., and a fourth unit, increasing the capacity to 50,000 hp., will be brought into operation early in September. The investment in the Nipigon system is now approximately $6,800,000. There was a heavy deficit a year ago and also a shortage of power for the increasing demand of the district. The situation is now greatly improved. The Great Lakes Pulp & Paper Co. is taking 10,000 hp. and the present revenue is about $787,500.

New Lamp Standards for D. C. Streets

TWO-LAMP street standards, shown herewith, have been adopted by the commissioners for use on certain streets and avenues in the District of Columbia. The design is based essentially on the Millet design of ornamental standards which have been used in Washington during the past twelve years, and was made by Capt. Joseph Gosling of Schenectady, N. Y. The standard is constructed of ornamental cast iron with steel pipe core, and the height from base to center of the lamp is approximately 22 ft. Each of the two lighting units is a 6.6. magnetite arc. The glassware is the new Washington globe of rippled clear glass opalescent flashed inside. All standards used in the District of Columbia require the approval of the National Fine Arts Commission.

Random Lines

Stealing the Weather Man's Stuff

Sir—A masonry inspector was making his daily report of work done. There had been a shower in the morning but the carpenters had completed a piece of formwork in the afternoon, ready to pour concrete the next day. Under the heading of "Remarks" on his report blank he wrote the following:

Rain today.
Will pour here tomorrow.
F. R. M.

* * *

The Latest Batch

Lawn Mower Engineers—H. & C. Davis & Co. in the Southwestern part of London, England.

Chain Store Engineer—Matthew S. Higgins of New York, who advertises that he gives courses in chain store technique.

BUILDERS ACCESSORY CO.
DAYTON, OHIO.
SPACE SAVING ENGINEERS

Purchase Engineering — A new brand described by James H. Collins, who ought to know better, in July *Business.*

Leasing Engineer — Some real estate agents of Los Angeles who apparently think that realtor is not sufficiently impressive.

* * *

Sharp Practice

The Industrial Organization and Finance Co., "*Industrial Engineers,*" is introducing a new razor around Chicago by having samples distributed free. The catch comes when a man comes around at the end of a week for the razor (or the cash).

* * *

Oh! That's Different!

Nothing, it appears, is exempt from the disillusionment dealt out by modern science. Many of us have been brought up to regard Plymouth Rock as a sacred symbol of the civic and social virtues of our Pilgrim forbears. But now comes Dr. Kunz, president of the American Scenic and Historic Preservation Society, who assures us that this object of our veneration is neither more nor less than a chunk of "biotite granite with altered plagioclase feldspar."

Whaddye mean, "Historic Preservation Society?"

* * *

Figure it Out

Advertisement in daily newspaper:

STEEL FORMS—Hustler who understands forms, likes hard ones and can keep them rolling; give details of experience and salary expected; letter only.

All experienced hard steel form rollers, here's your chance!

Engineering Societies

Calendar

Annual Meetings

AMERICAN SOCIETY OF SANITARY ENGINEERING, New York; Annual Convention, Philadelphia, Pa., Sept. 9-12, 1924.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston, Mass.; Annual Meeting, Rochester, N. Y.; Sept. 30 to Oct. 3.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS, St. Petersburgh, Fla.; Annual Convention, Boston, Mass., Sept. 29-Oct. 3, 1924.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; Fall Meeting, Detroit, Oct. 23-25, 1924.

The Connecticut Society of Civil Engineers held its annual summer meeting recently at Hammonassett Park, Madison, Conn. About 150 members attended and 17 new members were elected.

The Duluth Engineers' Club at its annual meeting on August 4 elected A. M. Frasee, president, W. L. Greenly and E. Joseph Erickson, vice-presidents; H. W. Richardson, secretary; and Fred Baluss, treasurer.

Personal Notes

DR. F. H. NEWELL, consulting engineer, formerly chief engineer and director of the U. S. Reclamation Service, and PROF. A. B. MCDANIEL, consulting engineer and construction personnel and educational specialist for the War Department have organized the Research Service, with office in Room 712, Investment Building, Washington, D. C. The new organization offers to conduct investigations of subjects of national interest and importance in engineering and economic fields, and to represent civic, governmental and trade organizations before legislative and administrative bodies upon matters of public interest. The Research Service will have available for advice and assistance in the solution of special problems economists, statisticians, legal experts and others.

C. A. HOGENTOGLER, of the U. S. Bureau of Public Roads, Division of Tests and Research, has been granted leave of absence to conduct for the Advisory Board on Highway Research of the National Research Council a fact-finding survey of the economic value of reinforcement in concrete pavements. This survey will be national in scope, will have the co-operation of many highway agencies, and will cover the various soils and traffic and climatic conditions throughout the United States.

JAMES C. PINNEY, dean of the College of Applied Science and Engineering, Marquette University, Milwaukee, Wis., has resigned to devote his time to private consulting practice. He will form an affiliation with J. A. L. Waddell of New York City, with offices in New York and Milwaukee, and will be in charge of the latter office. Mr. Pinney is a graduate of the engineering department of the University of Wisconsin. As dean of engineering in Marquette College, he established the co-operative plan combining shop work with college. At one time he was superintendent of bridges and public buildings in Milwaukee.

F. C. FRENCH, Lake City, Colo., consulting engineer and superintendent of the Colorado Consolidated Mines & Power Co., will be dean of the College of Applied Science and Engineering of Marquette University, Milwaukee, Wis., succeeding James C. Pinney, resigned. Mr. French is a civil engineering graduate of the University of Iowa and was at one time a professor in engineering there, also at the University of Utah. He was a major of engineers during the World War, and previously had served as government inspector of railroads in the Philippine Islands.

ALLAN G. WAGNER, maintenance engineer, California State Highway Commission, has been appointed city engineer of Sacramento, Calif., to succeed Albert Givan, who recently resigned. Mr. Wagner, who is a graduate of the University of California, has been with the California State Highway Commission for nine years. For some time he was chief designer in the bridge department and more recently has been assistant highway engineer.

EDWARD A. HOFFMAN, former assistant city engineer, has been named city engineer of Richmond, Calif., succeeding H. D. Chapman, who resigned to become city engineer of Venice, Calif. Mr. Hoffman was connected with the Richmond City Engineering Bureau since 1915 and filled the position of superintendent of streets.

H. E. PAWSON has been appointed general manager of the Ottawa Montreal Power Co. Mr. Pawson has been for the past year in charge of Nesbitt, Thomson & Co. in connection with its power interests and was previously manager of the municipal light and power plant of Sherbrooke, Que.

FRED LAVIS, consulting engineer, New York City, has been temporarily engaged by the New Jersey State Highway Commission as assistant engineer to supervise the work of construction of the extension of Route 1 to the entrance of the Hudson River vehicular tunnel. The extension involves the construction of approximately eleven miles of new highway, including a considerable amount of heavy bridging, subway construction and possible subaqueous tunnel construction under the Hackensack and Passaic Rivers.

HARRY G. SHAFER, former vice-president of the Nordyke & Mormon Co., Indianapolis, will shortly assume the position of chief of the division of equipment of the Indiana Highway Commission. He succeeds George Bartley who recently resigned.

Obituary

JAMES H. WILEY, of Dumont, N. J. head of the construction firm of James H. Wiley, Inc., New York City, died suddenly Aug. 7 in Long Beach, N. Y., where he had been convalescing after a long illness; he was 48 years of age. Prior to organizing his own firm seven years ago, Mr. Wiley had been associated for seventeen years with the George A. Fuller Co.

ROBERT C. SMITH, chief engineer of water-works, Binghamton, N. Y., died Aug. 5 at his home in that city, after a year's illness. Mr. Smith had been connected with the water-works department of Binghamton for twenty-five years and was the instigator of many improvements. He was born in Rouse's Point, N. Y., in 1854.

FENWICK J. T. STEWART, superintendent, New York Board of Fire Underwriters, died at his home in Summit, N. J., of pneumonia, on Sept. 6 at the age of 54. Mr. Stewart, who was a graduate in electrical engineering of Cornell University, was one of the leading fire protection engineers in the United States. He had been president of the National Fire Protection Association.

DANIEL A. TOMLINSON, manager of the Railways Bureau, Portland Cement Association, Chicago, died suddenly Aug. 7 while playing tennis on the Northwestern University Courts at Evanston, Ill.; he was born in Detroit in 1890. He studied at Lake Forest College, and at Massachusetts Institute of Technology from which he was graduated in 1912, later taking a special course at Armour Institute. For five years he was with the Chicago & Western Indiana R.R. as assistant engineer handling track elevation, yard construction, valuation and studies on terminal facilities. Following service in the Illinois National Guard in the Mexican expedition, the World War brought him a commission as second lieutenant. He was adjutant to the constructing quartermaster at Camp Grant, instructor of orientation at the officers' training camp and at the coast artillery school at Fort Monroe, Va., leaving the Coast Artillery Corps in 1919 as a captain. For a few months at the close of the war he was manager of the Central Zone, Professional and Special Section of the U. S. Employment Service, helping engineers get back into civilian work. Then for a year as assistant secretary of the American Association of Engineers he had charge of railroad and employment work. To his efforts largely were due the many salary increases of railroad engineers in 1919 and 1920. Mr. Tomlinson joined the staff of the Portland Cement Association in 1920, two years later being promoted to the position held when he died. He became a member of the American Society of Civil Engineers only a year ago, but had exercised his remarkable ability as an organizer and society worker in the National Guard, Western Society of Engineers and Chicago Technology Club.

From the Manufacturer's Point of View

A Point of Contact Between Maker and User of Construction Equipment and Materials

Japan's Building Program Fails to Materialize

American Cement Company Head Reports Depression in Construction Industry in Far East

G. S. Brown, president of the Alpha Portland Cement Co., who has just returned from a three months' study of conditions in the Far East, summarizes as follows his observations on the construction industry in Japan, China and the Philippines:

"The anticipated construction program of the Japanese to replace the buildings lost by earthquake and fire last year has failed to materialize. Temporary structures sufficient to house the people have been erected but little permanent construction has been started and when I was there no one seemed to have any knowledge as to when active, permanent reconstruction would be started.

"There is a surplus in Japan of all sorts of construction materials. Indeed, the construction industry is in a depressed condition in all parts of the Far East except in Hong Kong and Shanghai. The disturbed political condition in China prevents any extensive work, while in the Philippines fear that the islands will be given independence by the United States has the same effect.

"In Hong Kong and Shanghai, however, there is a large construction program in process. It is said this is financed by wealthy Chinese from the interior of China who are fearful that they will lose their wealth because of the present disturbed political conditions and are therefore putting it in Hong Kong and Shanghai where the English insure stability of government.

Japanese cement, Mr. Brown reports, is selling at a lower price than has ever been known in the Orient, due largely to the collapse of the reconstruction program.

Paving Brick Shipments Gain

Catching up on a late season, shipments of vitrified paving brick for June showed an increase of more than 3,000,000 over May, with a consequent falling off of stock on hand and a slight reduction of unfilled orders, according to the monthly report of the National Paving Brick Manufacturers Association. The report covers 23 companies representing only 62 per cent of the tonnage of the industry.

Production for June was 24,998,000 as against 26,569,000 for May. Shipments for June were 27,786,000 as against 24,507,000 for May. Stock on hand the last day of June was 111,637,000 as against 122,303,000 for May. Unfilled orders the last day of June totalled 99,314,000 as against 100,242,000 for May.

New Foreign Technical Standards

According to an announcement of the American Engineering Standards Committee, 29 West 39th St., New York, the following new foreign technical standards were issued during the past year by the standardizing committees or associations of the several countries concerned:

Austria — Dimensions and constructional details of stairways; dimensions and constructional details of wooden windows; dimensions and constructional details of wooden doors; regulations for the stability of chimneys, covering materials, design, wind pressure, and construction.

Belgium — Rules for the design and inspection of reinforced-concrete.

Canada — Specifications for billet steel reinforcement, rail steel reinforcement, and steel wire reinforcement for concrete.

Germany—Hinges, sash angles, and other accessories used on windows and doors; windows for small dwellings; dimensions of cellar windows; dimensions of natural stone steps for small dwellings; dimensions of concrete steps for small dwellings; dimensions of cast-iron sewer pipe; data relating to concrete sewer pipe; dimensions of small highway bridges; round steel reinforcement for concrete; specifications for structural steel for buildings.

Great Britain — Properties of rolled steel sections for structural purposes; blast furnace portland cement; sand-lime brick.

Holland — Gutter inlets, curb inlets, and catchbasins; specifications for testing salt glazed clay pipe.

Sweden — Dimensions of railway spikes.

Contractors' Plant Expense Analyzed by A. G. C.

In last week's issue (p. 241) was published a "Construction Equipment Schedule" prepared by the Associated General Contractors of America to show the annual expense of equipment ownership and maintenance, expressed in terms of original investment. Supplementing last week's figures, which referred to equipment operating on land, there is given herewith a table for marine equipment.

Construction Equipment Schedule

The table of percentage values given below represents for individual construction machines the annual expense of equipment ownership and maintenance, expressed in terms of original capital investment.

Equipment (1)	—Annual Expense, Per Cent of Capital Investment— Economical Life, Years (2)	Depreciation (3)	Interest (4)	Major or Shop Repairs (5)	Minor or Field Repairs (6)	Storage Incidentals, Equip., Overh'd (7)	Insurance (7)	Taxes (8)	Total (10)	Average Use Months, per Year (11)	Expense Per Working Month, Per Cent (12)
MARINE EQUIPMENT											
Coastwise Craft											
Derrick boats	10	10	5	5	3	5	5	1	34	8	4.2
Dredge, clamshell	12	8	5	4	2	5	5	1	30	8	3.7
Dredge, dipper	8	12	5	12	4	5	5	1	44	8	5.5
Dredge, hydraulic	10	10	5	5	2	5	5	1	33	9	3.6
Drill boats	12	8	5	8	3	5	7	1	37	10	3.7
Lighters	10	10	5	6	2	5	5	1	34	10	3.4
Pile drivers	8	12	5	5	3	5	5	1	36	8	4.5
Scows	12	8	5	4	2	5	5	1	30	10	3.0
Scows, dump	8	12	5	8	3	5	5	1	39	8	4.8
Tugs	10	10	5	10	3	5	5	1	39	10	3.9
Inland Craft											
Barges, wooden	8	12	5	4	4	5	4	1	35	8	4.3
Barges, steel	12	8	5	3	3	5	4	1	29	10	2.9
Derrick boats	7	14	5	6	5	5	4	1	40	8	5.0
Dredges, clamshell	7	14	5	6	5	5	4	1	40	8	5.0
Dredges, dipper	6	16	5	4	5	4	4	1	39	9	4.3
Dredges, hydraulic	10	10	5	5	4	4	4	1	33	9	3.6
Grader, hydraulic	7	14	5	4	4	5	4	1	37	8	4.6
Launches, gasoline	6	16	5	10	6	5	4	1	47	9	5.2
Pile drivers	7	14	5	6	5	5	4	1	40	7	5.7
Quarter boats	10	10	5	4	4	5	4	1	33	9	3.6
Rowboats	5	20	5	10	3	5	4	1	48	10	4.8
Steamers, paddle wheel	16	6	5	10	10	5	4	1	41	9	4.5
Tugs, screw propelled	16	6	5	10	6	5	4	1	37	10	3.7

Steel Reinforcing Bars to Be Simplified

Proposals for simplification of the varieties of steel reinforcing bars will be considered at a meeting Sept. 9 in the Department of Commerce, Washington, D. C., it is announced by the Division of Simplified Practice, under whose auspices the conference will be held. Based upon an analysis of experience and sales demand, it has been suggested by representative dealers that the following sizes of steel reinforcing bars be used as a basis for a simplified practice recommendation:

SQUARE: ½, 1, 1¼, and 1½ in.
ROUND: ⅜, ½, ⅝, ¾, ⅞ and 1 in.

Many rolling mills, manufacturers, dealers and consuming interests have already adopted these sizes. Endorsement of the recommended sizes will be asked from Government departments and technical bodies, as well as architects, contractors, engineers, bridge and road builders as well as other consuming interests.

Business Notes

PAWLING & HARNISCHFEGER CO., Milwaukee, manufacturer of crane and excavating machinery, has recently added to its plant for the manufacture of heavy machinery the steel foundry formerly operated by the Hercules Steel Casting Co. When operating two shifts this foundry will be able to turn out all of the 400 tons of carbon-steel and alloy-steel castings used each month in P&H production. In the production of its overhead traveling cranes, hoists, gasoline powered shovels, draglines, skimmer scoops, trenchers and other equipment the Pawling & Harnischfeger Co. now has full control of the process from pig iron to finished machine.

UNITED STATES GYPSUM CO., Chicago, has enlarged its lime plant at Genoa, Ohio, by the addition of thirteen new kilns and other equipment costing $300,000. When the entire bank of 40 kilns is in operation this is the largest hydrated finishing lime plant under one roof in the world, its capacity being 500 tons a day.

MAINE ELECTRIC CO., Portland, Me., manufacturer of steam and electric hoists and derricks, has opened an office at 814 Walnut St., Philadelphia, which will be in charge of F. V. Wetherill.

AUSTIN MACHINERY CORPORATION has recently moved its general offices from Toledo, Ohio, to Muskegon, Mich.

F. M. ENGLISH has been appointed assistant sales manager of the Reading Iron Co., Reading, Pa., succeeding A. F. McClintock resigned.

WHITING CORPORATION, Harvey, Ill., builder of cranes, gate hoists and special machinery for water power plants, has established a separate department to handle complete installations for head gates, sluice gates, etc. The department will be in charge of A. E. Johnson, formerly of the Dominion Bridge Co.

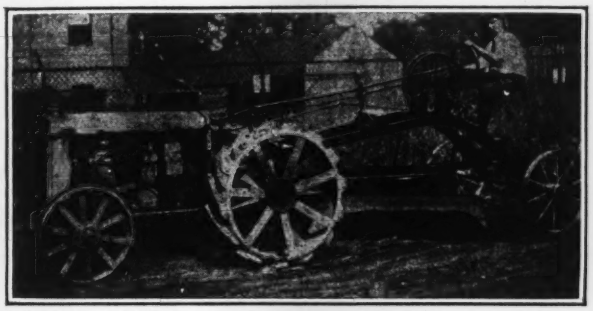
Equipment and Materials

New ½-In. Portable Electric Drill

The latest addition to the line of portable electric drills manufactured by the Van Dorn Electric Tool Co., Cleveland, Ohio, is the "Haffinch" weighing 16 lb. and operating on alternating or direct current. In this machine the armature shaft is carried on ball bearings and there is also a small thrust bearing on the spindle. The drill is designed for boring either steel or wood.

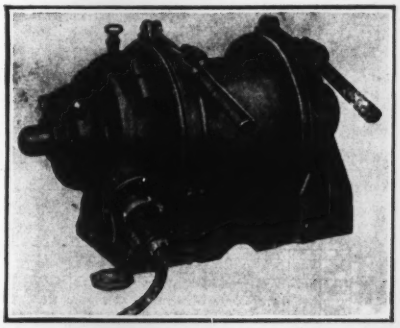
Fordson Attachment for Grader

With the device recently put on the market by the Good Roads Machinery Co., Kennett Square, Pa., it is possible to attach the Winner patrol, Little Winner and Standard Winner road graders to Fordson tractors and operate the latter from the rear seat of the grader machine. The attachment consists of forged parts bolted to the rear axle of the tractor. After removing the front truck of the grader, the latter is coupled to the attachment by a steel king pin, the draft being directly from the grader blade to the tractor drawbar. The accompanying illustration shows how the tractor is controlled, both with regard to steering and power, from the grader seat.



New Electric Portable Hoist

Similar in size and capacity to the Turbinair portable hoist operated by compressed air, a new portable unit in both single and double-drum models, operated by electric motor, has been placed on the market by the Sullivan Machinery Co., Chicago. The horsepower and rating of the new hoist is similar to that of the compressed-air machine, namely 6½ hp. with a capacity of 2,000 lb. dead-load lifted vertically at a speed of 110 ft. per minute on a single line. The single-drum hoist has a drum 11⅛ in. in diameter by 8¼ in. long, capable of holding 500 ft. of ⅝-in. wire cable. The single-drum unit weighs 480 lb. and is adapted to a variety of uses in tunnels, quarries, construction jobs, and material-handling yards.



In the double-drum unit, which weighs 770 lb., the motor is mounted between the two drums on a central standard, furnishing power to the drums through reduction gears. The haulage drum has an operating speed at full load (2,000 lb. vertical lift) of 110 ft. per minute, while the tail-rope drum provides for 160 ft. per minute for handling the empty scraper or dragline. In both single and double-drum models the motor is contained entirely within the drum, insuring compactness and ease of handling.

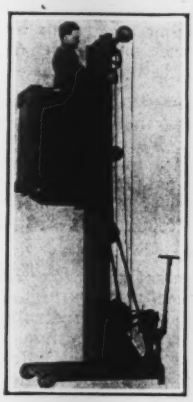
New Grease Cup

The Link-Belt Co. of Indianapolis has developed a new top for its regular compression grease cup. This top is hexagonal in shape, which provides not only a good grip for the hand but one for a wrench. Cold, stiff grease makes a compression cup very hard to turn, and a pipe wrench is not always accessible. The hexagonal shape provides grip spaces for the ordinary wrench.

The cup is provided with a raised slot so that it can be turned with a screw driver, when it is so located that it is inconvenient for the hand or wrench. The new cup is made of malleable iron, and is known as the Hex-Top.

Elevator Control Stacker

An elevator control type of stacker for crates, bales and other packages, which permits the operator to ride on the platform, has been added to the line of material-handling and moving equipment manufactured by the Lewis-Shepard Co., 609 East First St., Boston. The equipment is electrically operated and the control of the motor is by means of a cable on which the operator in the accompanying illustration has his right hand. Thus, the lifting platform may be stopped at any desired level, unloaded and returned again to floor level.



The stacker has a lifting speed of 40 ft. per minute with a load of 1,000 lb. The drive is by a worm operating in an oil-tight housing; there are no exposed gears. Power is supplied by a 2½ hp. electric motor operated through a dead-man type of controller. There is an automatic limit stop at both top and bottom of the platform travel, making the machine fool-proof even when operated by inexperienced men.

The equipment is mounted on a carrying platform supported on three wheels operating on roller bearings.

Another Size of Shovel Equipped with Diesel Engine

A further addition to its line of Diesel shovels and dragline excavators has recently been announced by the Bucyrus Co., South Milwaukee, Wis. This machine, which is the largest of its three small revolving machines, is known as the 50-B. As a shovel it

carries a 1¾-yd. dipper, and may be had with standard high-lift or extra high-lift booms, thus adapting it to a very broad range of digging conditions. As a dragline it may be had with a variety of boom and bucket combinations, ranging from a 45-ft. boom with a 1½-yd. bucket to a 60-ft. boom with a ⅝-yd. bucket. As is the case with the steam machine, it may also be had with crane or clamshell bucket equipment.

The Atlas-Bucyrus engine with which the shovel is powered is a mechanical injection, four-cycle, four-cylinder, slow-speed, heavy duty 9 x 12-in. engine, running at a speed of 300 r.p.m.

Publications from the Construction Industry

Jacks—DUFF MANUFACTURING CO., Pittsburgh, in an 86-p. illustrated catalog features its line of jacks. The types include ball bearing and screw jacks with capacities up to 75 tons, track or trip jacks with which the load may be instantly dropped, automatic lowering jacks which must be ratcheted up or down, notch by notch, jacks for wrenching and unwrenching oil well tools and special purpose jacks for cable reels, pipe forcing and motor armature lifts. Several pages are devoted also to extensible trench braces.

Quarrying Tools—SULLIVAN MACHINERY CO., Chicago, in a 19-p. illustrated bulletin just issued, describes three kinds of tools for quarrying purposes. These include plug and foot hole drills, hand feed hammer drills and stone dressing tools. All are of the pneumatic type.

Equipment for Cement and Stone Industries—JEFFREY MANUFACTURING CO., Columbus, has published an illustrated 88-p. catalog featuring its equipment for the cement, stone and allied industries. The text and illustrations show the wide variety and application of chains and attachments, sprocket wheels, conveyors, elevators, pulverizers, crushers, lime grinding plants, portable loaders and bag stackers.

Electric Traffic Signals—CROUSE-HINDS CO., Syracuse, N. Y., describes and illustrates its electric devices for street traffic signaling in a 36-p. pamphlet illustrated in color. The company's system of traffic control is based on displaying colored lights visible during the day as well as night. These lights may be mounted in a variety of ways—on vertical posts or towers on horizontal arm suspensions, on span wire suspensions, and on special brackets from poles. The larger units display lights of three colors, green for "Go," amber for "Caution" and red for "Stop." The photographs show a number of typical installations including posts or towers in the middle of the street, wire suspensions over street intersections, and brackets or suspension arms on electric light poles. In connection with the signals proper, the company manufactures a line of manual control switches and automatic timing switches, electrically operated.

Business Side of Construction

FACTS AND EVENTS THAT AFFECT COST AND VOLUME

Four of the Six U. S. Geographic Sections Ahead of 1923 Waterworks Construction Record

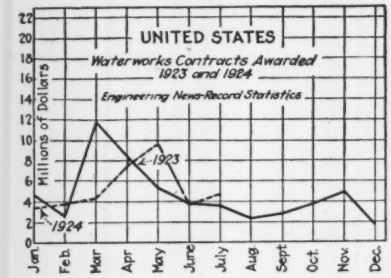
Statistics compiled by *Engineering News-Record* covering water-works contracts of $15,000 and over show that the work in 1924 is holding very close to the 1923 record. Water-works construction during 1923 was the greatest of any of the nine preceding years. So far this year, the New England, Southern, West of the Mississippi and the Far West sections have surpassed their 1923 records.

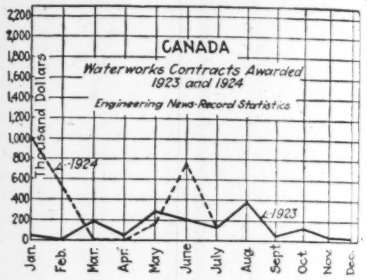
The total for the first seven months of the current year was $89,501,000 for the entire United States, at the minimum just mentioned. Canada registered $2,669,000 during the same period. This represents a drop of about 11 per cent from the record 1923 total for the United States and a gain of over 100 per cent for Canada.

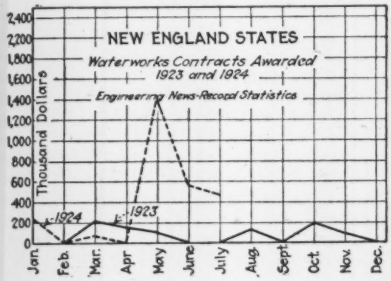
So far this year, the heaviest water-works construction has been in the states immediately west of the Mississippi. Last year the great bulk of this type of construction was confined to the Middle Atlantic section.

Despite the slight decrease in money value compared with the first seven months of 1923, the total number of awards has been greater this year, with a smaller average value per contract.

May has been the heaviest month this year in water-works construction; last year reached its peak in March.


UNITED STATES
Waterworks Contracts Awarded 1923 and 1924
Engineering News-Record Statistics
Millions of Dollars
1923
1924
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

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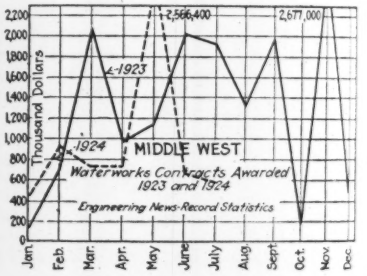

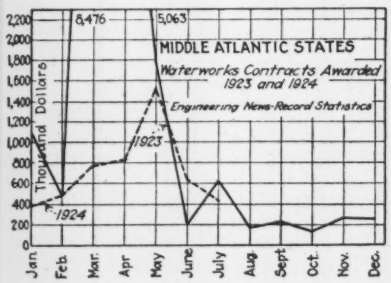

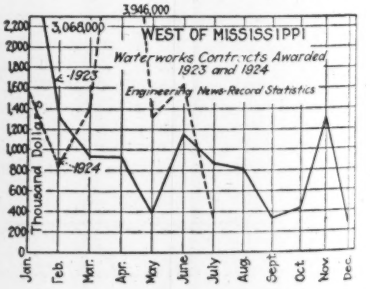

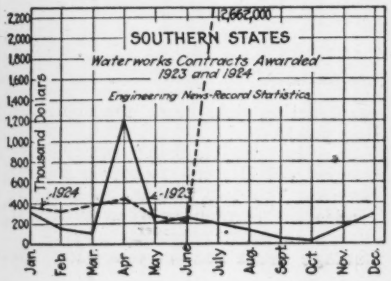

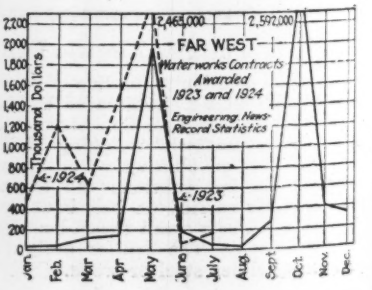

Iron, Steel and Lumber Output Slower Than Year Ago—Cement and Brick Production Gain

Drop in Unfilled Steel Tonnage Smaller Than Expected—Materials Dealers Report Improvement in Demand

Iron—The July pig-iron output amounted to 1,784,899 tons as contrasted with 2,026,221 in June and 3,678,334, in July, 1923, according to the U. S. Department of Commerce.

Steel—Ingot production for July as calculated by the American Iron and Steel Institute (all companies) reached 1,869,416 tons, compared with 2,056,466, for the month preceding and 3,531,458, during the corresponding period in 1923. The total for the first seven months of the current year is 21,518,444 tons as against 26,858,423, for the corresponding period last year.

The amount of forward business on books of the U. S. Steel Corporation, July 31, aggregated 3,187,072 tons as compared with 3,262,505, on June 30 and 5,910,763, July 31, 1923. Although the reduction in unfilled tonnage amounted to 75,433 tons, this was much smaller than had been expected early in July.

Ingot production figures for the first seven months of this year and last, are as follows:

Month	1924 Tons	1923 Tons
January	3,633,639	3,841,095
February	3,809,185	3,471,843
March	4,187,942	4,066,680
April	3,333,535	3,963,736
May	2,628,261	4,216,355
June	2,056,466	3,767,256
July	1,869,416	3,531,458
	21,518,444	26,858,423

Lumber—Production, shipments and new orders for the week ended Aug. 2, showed an increase over the preceding week, particularly in shipments and orders, according to the National Lumber Manufacturers' Association. Compared with the corresponding week in 1923, however, there was considerable gain in both shipments and demand; production was slower with fewer mills reporting.

A weekly comparison of lumber movements follows:

	Week Ended Aug. 2 Ft. b.m.	Corresponding Week in 1923 Ft. b.m.	Preceding Week in 1924 Ft. b.m.
Mills	354	384	363
Production	209,070,721	251,435,129	207,720,062
Shipments	235,914,810	215,947,115	200,951,500
Orders	251,535,492	210,632,680	229,372,991

The following figures show the lumber movement for the first thirty-one weeks of 1924, compared with the same period in 1923:

	Production Ft. b.m.	Shipments Ft. b.m.	Orders Ft. b.m.
1924	7,117,803,933	7,045,468,360	6,745,252,035
1923	7,320,770,457	7,567,254,135	7,062,501,764
1924 (Decrease)	202,966,524	521,785,775	317,249,729

Cement—There were 14,029,000 bbl. of Portland cement produced at mills throughout the country during July, according to the Geological Survey. The June output was 13,538,000 bbl. and that of July, 1923, 12,620,000 bbl. While production increased substantially, there was also a similar improvement in demand, leaving stocks available at mills slightly below June of this year and much heavier than the amount on hand one year ago. The cement situation, with relation to production, demand and reserve stocks, follows:

	Production Thousand bbl. 1923	Production Thousand bbl. 1924	Shipments Thousand bbl. 1923	Shipments Thousand bbl. 1924	Stocks at End of Month Thousand bbl. 1923	Stocks at End of Month Thousand bbl. 1924
First Quarter	26,080	27,746	22,044	20,138	13,045 (Mar.)	18,189 (Mar.)
Second Quarter	36,651	39,041	40,518	42,358	9,168 (June)	14,903 (June)
July	12,620	14,029	13,712	16,614	8,081	12,318

Brick—Reports from the Common Brick Manufacturers Association of America, as of July 1, show substantial gains in the number of burned and unburned brick on hand at yards throughout the country. There were fewer brick moved from yards, however, during the month. A slight drop also occurred in unfilled orders. The current situation compared with a month ago and one year ago, is shown in the following table:

	Burned Brick On Hand, M	Unburned Brick on Hand M	Brick Moved From Yard During Month M	Orders on Books M
1923				
July 1	153,487	43,327	.....	395,447
1924				
Jan. 1	313,696	55,646	66,199	266,914
Feb. 1	306,503	38,349	45,762	272,403
Mar. 1	282,813	39,695	104,663	263,219
Apr. 1	250,118	46,226	142,197	335,926
May 1	238,703	58,972	169,855	382,778
June 1	223,458	70,802	163,298	394,156
July 1	258,474	72,725	158,753	366,098

While the nation's output of iron, steel, lumber and other basic materials is considerably below that of a year ago, substantial gains are reported in production of cement and in the number of common brick available at yards.

Increase in current demand rather than actual scarcity is probably responsible for the slight rising tendency in prices of several materials. Present ample mill reserves and well stocked dealers' warehouses would support this opinion.

Business Briefs

Call money, Aug. 11, remained at 2 per cent.

Time loans; short terms, 2½@2¾ per cent; longer periods, 3@3¼ per cent.

Commercial paper; best names, 3¼@3½ per cent; other names, 3¾ per cent.

Foreign exchange (Demand):

	Normal	This Week	Last Week	Year Ago
Sterling	$4.8665	$4.55⅛	$4.45⅛	$4.56⅛
Franc	0.193	0.0568½	0.0539½	0.0554
Lira	0.193	0.0453¼	0.0439¼	0.0426⅛

Bids Wanted on Big Jobs

Among the projects on which bids are either asked or will soon be called for in Construction News, pp. 87 to 99, are the following:

Train sheds, Chicago, Ill., for Chicago Union Station Co., $1,000,000.

Paving, curbing and guttering, Dallas, Tex., by City Comn., $1,000,000.

Bank, Boston, Mass., Boston Five Cents Savings Bank, $1,000,000.

CONDITIONS OF MATERIALS STOCKS IN IMPORTANT CENTERS

Stocks on hand in approximate figures, example: (Lumber, Denver, 40,000,000 ft.); time required for delivery of carload lots to city job, example: (Hollow tile, Atlanta, deliveries take 4 to 5 days); and stocks on hand in general terms, example: (Sewer pipe, Detroit, plenty, all sizes).

	Los Angeles	San Francisco	Denver	Minneapolis	Detroit	New Orleans	Atlanta	New York
Sewer pipe	Supply equals demand	Stocks large	Del. week behind orders	Stocks ample; mill del. prompt	Sufficient stocks of various sizes	Stocks plentiful; demand good	Del. take 4 to 5 days	Dealers' stocks usually small
Cement	Good supply and delivery	Dealers' stocks in good shape	Stocks in good shape	Large quantity available; mill del. prompt	Warehouse stocks ample; plenty at nearby plants	Sufficient	100 cars	More on hand than year ago
Lime	Supply and delivery good	Fairly well supplied	Sufficient	Quick del. from source	Plenty in local warehouses	Adequate	75 to 80 cars	Dealers' stocks usually small
Common brick	Supply and demand good	Large reserves	5,000,000	Good quantity near at hand	Large supply in local yards	Normal	Plenty	More common brick than year ago
Hollow tile	Fair supply and demand	Large quantities at kilns	Del. week behind orders	Obtainable in short order	No large stocks carried; del. from kilns in few days' notice	Ample	Del. take 4 to 5 days	Dealers' stocks usually small; prompt del. by rail and water
Lumber	Smaller quantities being received	Very large reserve	40,000,000 ft.	Retail and wholesale yard stocks trifle below normal	Stocks about average; no shortage	Reserves low	Plenty	Stocks smaller than year ago; demand heavier
Asphalt	Large amount used; good supply on hand	Considerable quantity available	Limited quantity on sidings	Quickly obtainable from source	Sufficient available for current work	1,150 tons available; 1,500 tons needed	75 cars	Heavy reserves near city
Structural steel	Demand brisk; no delay in orders	Fairly good warehouse reserves	Warehouses well stocked	Mill del. obtainable in short order	Normal stocks in warehouses and fabricating shops	Plenty; demand below normal	4 to 5 cars	Demand principally for structurals

Large Contracts Let During Week

Among the week's announcements of contracts awarded in Construction News, pp. 87 to 99, are the following:

Apartment, Detroit, Mich., to Wallbridge-Aldinger & Co., $2,500,000.

Plant and Office, Detroit, Mich., to Crowell and Little Constr. Co., Cleveland, O., $2,000,000.

Sewer improvement, North Bergen, N. J., to Clinton Asphalt Co., $1,595,511.

Hotel, Dallas, Tex., to W. M. Rice Constr. Co., $1,300,000.

Concrete road, Amherst, N. Y., to H. Meyers and Co., $1,000,000.

High School, Brooklyn, N. Y., to W. L. and G. H. O'Shea, $1,000,000.

Restriction on Pittsburgh Plus Pleases Chicago

In the restriction placed on the steel companies by the Federal Trade Commission to abandon the Pittsburgh plus system of price quotation, business men in the Chicago and the Calumet Districts are finding cause for much elation. That Chicago will eventually be the principal steel market of the country is their opinion. Numerous industries in this lower Lake District will now make their planned extensions and others which have delayed locating until the case was decided will build new steel fabricating industries. The Chicago Association of Commerce estimates that $200,000,000 will be spent in the next few years on such work. The Insull interests, generally conceded to have the longest heads in the Middle West as to future requirements for power, are building a $40,000,000 superpower plant near the Illinois-Indiana line for what they call the future workshop of America, the greatest steel center of the world.

Next week—Résumé of recent public bond sales covering large construction projects.

Weekly Construction Market

THIS limited price list is published weekly for the purpose of giving current prices on the principal construction materials, and of noting important price changes on the less important materials. Moreover, only the chief cities are quoted.

Valuable suggestions on costs of work can be had by noting actual biddings as reported in our Construction News section.

The first issue of each month carries complete quotations for all construction materials and for the important cities. The last complete list will be found in the issue of August 7, the next, on September 4.

Steel Products:	New York	Atlanta	Dallas	Chicago	Minneapolis	Denver	San Francisco	Seattle	Montreal
Structural shapes, 100 lb.	$3.34	$3.80	$4.20	$3.10	$3.35	—$4.00	—$3.40	—$3.35	$4.20
Structural rivets, 100 lb.	3.75	—4.30	4.90	3.50	3.75	—4.65	5.00	—3.75	6.00
Reinforcing bars, ¾ in. up, 100 lb.	3.24	3.30	3.38	3.00	3.25	3.87½	3.35	—3.25	2.70
Steel pipe, black, 2½ to 6 in. lap, discount	44%	54.2%	43%	—53%	55.05%	36%	36.80@49.10%	45%	47.43
Cast-iron pipe, 6 in. and over, ton	60.60@61.60	+54.00	+60.00	56.20@57.20	58.50	68.00	59.00	65.00	65.00
Concreting Material:									
Cement without bags, bbl.	2.50@2.60	2.35	2.05	2.20	2.42	2.84	2.61	2.90	1.80
Gravel, ¾ in., cu.yd.	1.75	—1.40	2.38	2.75	1.85	1.90	2.15	1.50	1.25
Sand, cu.yd.	1.00	1.40	2.00	2.75	1.25	1.00	1.50	1.50	1.25
Crushed stone, ¾ in., cu.yd.	1.85	2.00	2.83	—2.75	1.75	3.50	2.15	3.00	2.25
Miscellaneous:									
Pine, 3x12 to 12x12, 20 ft. and under, M.ft.	57.00	—35.00	57.20	—55.00	—37.75	—34.75	—31.00	+23.00	60.00
Lime, finishing, hydrated, ton	18.20	22.50	20.00	+20.00	25.50	24.00	22.60	24.00	21.00
Lime common, lump, per bbl.	3.00@3.25	1.45	1.85	1.50	1.40	2.70	2.15	2.80	10.50
Common brick, delivered, 1,000	—19.25@20.35	11.00	14.10	12.00	13.00	12.00	15.50	15.00	17.50
Hollow building tile, 4x12x12, per block	Not used	.10	.11	—.089	.08	.085	.....	.11	.12
Hollow partition tile 4x12x12, per block	.1162	.10	.11	—.089	.....	.085	.108	.11	10
Linseed oil, raw, 5 bbl. lots, gal.	+1.05	+1.12	+1.20	—.94	1.14	+1.24	—1.01	1.13	1.01
Common Labor:									
Common labor, union, hour	.75	.30	.....	.87½	.....	.50@.55	.55	.62½	...
Common labor, non-union, hour	....	.25	.30@.50	.82½	.50@.55	.35@.50	.50	.62½	.30

Explanation of Prices—Prices are to contractors in carload lots unless other quantities are specified. Increases or decreases from previous quotations are indicated by + or — signs. For steel pipe, the prevailing discount from list price is given; 45-5% means a discount of 45 and 5 per cent.

New York quotations delivered, except sand, gravel and crushed stone, alongside dock; common lump lime, in 280-lb. bbl. net, and hydrated lime f.o.b. cars; tile "on trucks"; linseed oil and cast-iron pipe f.o.b.

Labor—Concrete laborers' rate, 93½c.; building laborers (pick and shovel men) 75c. per hr.

Chicago quotes hydrated lime in 50-lb. bags; lump finishing lime per 180-lb. net. Lumber delivered on job.

Minneapolis quotes on fir instead of pine. Brick, sand and hollow tile delivered. Cement on cars. Gravel and crushed stone quoted at pit. We quote on brown lime per 180-lb. net; white is $1.80 for Kelly Island and $1.70 for Sheboygan. Common labor not organized.

Denver quotes on fir instead of pine. Cement "on tracks"; gravel and sand at pit; stone on cars; lime, brick, hollow tile and lumber on job. Tile price is at warehouse. Linseed oil, delivered, in wooden bbl. Common lump lime per 180-lb. net.

Atlanta quotes sand, stone and gravel per ton instead of cu.yd. Common lump lime per 180-lb. net.

Dallas quotes lime per 180-lb. bbl. Steel, cement, cast-iron pipe and crushed stone f.o.b. cars, other materials delivered.

San Francisco quotes on Heath tile, size 5½ x 8 x 11½. Prices are all f.o.b. warehouses except C. I. pipe, which is mill price plus freight to railway depot at any terminal. Common lump lime per 180-lb. net. Lumber prices are to dealers in yards at San Francisco, for No. 1 fir, common.

Seattle quotes on Douglas fir (delivered) instead of pine. Lump finishing lime per 180-lb. net. Hollow building tile delivered. Hydrated lime in paper sacks. Sand and gravel at bunkers.

Montreal quotes on pine lumber. Sand stone, gravel and lump lime per ton. Stone, lime and tile are delivered; sand, gravel and cement on siding; brick f.o.b. plant; steel and pipe at warehouse. Hollow tile per ft. Cement price is in Canadian funds (the Canadian dollar stands at 99.81). Bag charge is 80c. per bbl. Discount of 10c. per bbl. for payment within 20 days from date of shipment. Steel pipe per 100 ft. net; 3-in., $47.43; 6-in. $119.

Conditions Affecting the Market

There have been sufficient price advances in building materials during the past two weeks to justify a belief that the recent downward trend has been definitely checked.

Reports received by *Engineering News-Record* show the following rises: linseed oil in New York, Atlanta, Denver and Dallas; hydrated lime in Chicago; c.-i. pipe in Atlanta, Dallas and Chicago and Douglas fir in Seattle.

Telegraphic reports from the fir timber districts state that reserve stocks held in Seattle and Puget Sound mills are the lowest on record and that this season's production has not been increased to meet expanding demand.

Declines, however, occurred in steel shapes at Denver, San Francisco and Seattle warehouses; rivets dropped in Denver, Seattle and Atlanta and steel bars are lower in Seattle. Other declines were as follows: steel pipe in Minneapolis; gravel in Atlanta; crushed stone in Chicago; lumber in Atlanta, Chicago, Minneapolis, Denver and San Francisco; common brick in New York; hollow tile in Chicago and linseed oil in Chicago and San Francisco.

Common brick prices dropped $2.20 to $3.30 per M. in New York City during the past two weeks. Present quotations are $19.25 to $20.35 as against the former range of $21.45 to $23.65 per M. delivered.

Unfilled orders on books of brick manufacturers in the New York-New England district, dropped off about 37 per cent during the month.